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ON ECONOMY IN THE USE OF ALCOHOL IN PHARMACY.

By William Procter, Jr.

It has often been a cause of remark among American apothecaries as to how their British confreres get on in preparative pharmacy with alcohol at four dollars per gallon. The low price at which this important solvent has been attainable, until a recent date, has induced its free employment in pharmaceutical processes, and in the late revision of our Pharmacopœia its use has been even more extensively resorted to in preparing extracts, fluid extracts and resins than in previous editions.

The use of alcohol offers many advantages:—1st, in its efficiency as a solvent of medicinal principles; 2d, its rejection of inert starchy and gummy substances; 3d, its greater volatility, requiring less time and heat in evaporation.

But just as this authoritative codex has been promulgated, the apothecary, the agent who is to carry out its precepts, is met by the stubborn fact that alcohol, owing to the war tax on whiskey, and the rise in the price of grain, has risen from 50 cents to 180 cents per gallon, with the prospect of a greater rise from an additional war tax! It may be asked, under these circumstances, what course is the pharmaceutist to adopt? Must he proceed as though no change in the price of this solvent had occurred, and add on its cost to his preparations, or can he, by a judicious use of the solvent, accomplish the end with a less quantity and more

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effectually, whilst much of what is used may be recovered by distillation.

To make a pint of a Fluid Extract, a quart of alcohol in the shape of diluted alcohol is required, and often much more is used. As many apothecaries have no facilities for recovering alcohol by distillation, this must, in these cases, be added in full to the cost of the preparations.

It is believed that, in most instances, where alcohol is merely used as a solvent, it may be partially recovered by distillation without serious injury to the preparations, but the particular object of this paper is to direct attention to the importance of economizing in the use of alcohol by a more skilful conduction of the process of percolation, using more time and less alcohol, so as to get an equal quantity of dissolved matter with a smaller amount of solvent. This is entirely practicable in most instances by the use of uniformly fine powders, (with a few exceptions), and by regulating the flow from the percolator so that the fluid shall have time to exert its maximum solvent power.

The directions in the new Pharmacopœia, in the preliminary chapter on percolation and powders, are so explicit and full that the reader should be at no loss to understand them. Failure, if it occur, must therefore arise from neglect of these precautions. Let us take, for example, Fluid Extract of wild cherry bark:—Sixteen troyounces of powdered bark are to be extracted by means of ordinary alcohol, (sp. grs. ·835), and the alcohol is afterwards to be wholly separated from the extracted matter. If a fine powder is used as directed, duly moistened with a fourth of its weight of alcohol, and then compressed in the percolator, the fluid will pass slowly and almost like syrup in consistence at first, and long before the quantity directed in the Pharmacopœia has passed, the bark will have been nearly exhausted. This should be set aside and water containing a little alcohol added to the percolator to displace the absorbed alcohol, until the liquid passes cloudy, when the process may be stopped. Now, by resorting to a still heated by a water bath, as recommended at page 13 and page 22 the alcohol may be recovered almost entirely.

These remarks apply to the fluid extracts of Ipecacuanha, Sarsa-

parilla, Senna, Gentian, Dulcamara, Cinchona, Colchicum, etc.; to the Extracts of Arnica, Cinchona, Podophyllum, Colocynth, Dulcamara, Nuxvomica, Ignatia, Jalap, and Seneka; the Resins of Jalap, May-apple and Scammony, and to compound Syrups of Sarsaparilla and Squills.

Of course these remarks do not apply to the tinctures where alcohol is permanently retained, except so far as the recovery of the last portions absorbed in the dregs is concerned, where the the bulk of these renders the quantity retained an object. It is suggested that the impure alcohol, more or less diluted, which may from time to time be recovered from tincture dregs should be kept in a common receptacle until its quantity offers an inducement to purify it by a careful distillation.

Neither do they apply to the Ethers, to Chloroform, or to the Spirits, the prices of which will have to be raised to cover the increased price of the alcohol they contain or consume.

Allusion has been made to distillatory apparatus, noticed in this number. It is believed that these offer several advantages worthy of adoption, but that much power and convenience may yet be obtained by the adaptation of a steam heating apparatus, capable of being carried on by gas heat on the working counter, to the operations of evaporation and distillation.

Philadelphia, Dec. 1863.

NOTE ON FUNNELS AND WEIGHTS.

By Prof. Millington,

Late Professor of Chemistry in William and Mary College, Va., and in the University of Mississippi.

To the Editor of the Journal of Pharmacy:

Sir—On page 572 of the November number of your work, you have some hints in regard to Funnels, and ask an improvement in their construction. I beg to say I have been in the habit of using a simple contrivance in my Laboratory that seems to obviate the difficulty complained of,—viz: the escape of air from a bottle while the liquid is flowing into it. I have several pieces of wire, or sticks glass, or strips of sheet lead,

about four or five inches long, bent into the form of the capital letter U. One end of this implement is introduced into the bottle before inserting the funnel, which now cannot possibly fit the neck so as to obstruct the air from flowing out; or a narrow strip of window-glass or two may be cemented on to the outside of the funnel, and will answer the same purpose.

The subject of medical weights has been taken up in the late edition of the Pharmacopœia of the United States, and is now occupying the attention of the profession. Small weights are very subject to be lost or blown away, and, if accurate, are always expensive. Any careful person, can, however, make their own small weights by adopting the process I make use of, which is as follows: Procure some pieces of wire, of such diameter that about three or three and a half inches may weigh ten grains in an accurate balance. Adjust the piece you are about to use to that weight exactly, by cutting off its length with a sharp pair of scissors or pincers. Double the wire into two equal halves, and with a sharp chisel and blow of the hammer cut the piece in two at the bend. Weigh the two pieces against each other: they ought to be exactly five grains each. Next fix these two pieces on to the smooth surface of a piece of sheet lead by a very little rosin or wax cement. Then, with an accurate pair of small dividers or compasses, divide each wire into five equal parts, and mark the divisions slightly on the lead. Then, with the chisel, as before, cut off one division from one of the wires, and two divisions (in one piece) from the other. Then take up the wires, and, by the heat of a spirit lamp, clean off all the cement carefully, and you will be in possession of a one, two, three, and four grain weight; and with them any number of grains can be weighed up to ten grains. Lastly, bend the one grain weight into a circular curve, to prevent its rolling about; the two grain bend to the shape V; the three grains into a triangle; and the four grain into a square. Brass or iron wire will answer, but for the best weights platinum or pure gold wire should be selected. By using finer wire, and beginning with one grain, decimals of a grain can be obtained; or by larger wire, the decimals of a gramme. These, and all small weights, should always be handled by a pair of nippers.

ON THE RELATIVE ACTIVITY OF AMERICAN AND EUROPEAN ACONITE ROOT.

By William Procter, Jr.

At the Meeting of the Association held in Philadelphia, September, 1862, the following query was accepted by me: "What is the relative activity of the root of Aconitum napellus grown in the United States and that imported from Europe, based on their yield of aconitia, and what objections, if any, exist to the economical culture of the plant in the United States." Soon after the meeting adjourned, a letter was addressed to Messrs. Tilden & Co., of New Lebanon, New York, who cultivate aconite for making the extract, requesting their aid in obtaining a sufficient quantity of the American grown root, to make the comparison. The very early setting in of the winter interfered with their getting the root, and it was not until early spring, when the frost left the ground, that they could have it gathered. It was then carefully dried. The quantity received was rather more than a pound avoirdupois. So carefully had the roots been removed that the fibres were mostly remaining; the main roots varying in diameter at the caudex from a quarter to three-quarters of an inch, and from three to six inches in length, including the tap root. The color of the epidermis is purplish brown, inclined to black on the older portions, and the odor is rank and somewhat like that of opium.

After carefully drying the aconite it was ground to moderately fine powder. 5000 grains of this were macerated for two weeks,* in sufficient alcohol, sp. gr. ·835, to moisten it, then packed into a glass percolator, and slowly percolated with alcohol until five pints of tincture had passed. The percolate was placed in a retort, and, by aid of a water bath, four pints of alcohol were recovered, and the residue evaporated to four fluidounces. To this a fluidrachm and a half of diluted sulphuric acid mixed with a fluidounce of water was added, and the whole evaporated to two fluidounces and a half. The residue was syrupy in consistence, with oleo-resinous globules floating on it, with a decided acid reaction. The aconitia being in the state of sulphate, and hence in-

* This long maceration was rather accidental than intentional.

soluble in strong ether, the liquid was agitated with two fluidounces of washed ether to remove the oleoresin; after decanting, the washing was repeated. The aconite liquor was now treated with an excess of solution of ammonia to liberate the aconitia, and the alkaline mixture washed by agitation and decantation with three separate portions of ether, of two fluidounces each. The ethereal liquids, united, were evaporated spontaneously in a tared capsule: the residue weighed sixty grains, and was dark colored, strongly alkaline and not entirely hard, owing to a little oleoresin present that had not been completely removed by the preliminary washing. The impure mass was mixed with a fluidounce of distilled water, and diluted sulphuric acid carefully dropped in, with the application of heat, until the acid ceased to be neutralized, and the liquid remained slightly acid. A residue of dark brown oleoresin remained. The fact of this occurring shows the importance of well washing the solution before separating the aconitia. The solution of impure sulphate of aconitia was now filtered and the filter carefully washed. The filtrate weighed 585 grains troy. To ascertain the aconitia strength of this liquid, it was assayed by the process of Prof. F. F. Mayer, (Amer. Jour. Pharm., vol. xxxv. p. 23,) with iodohydrargyrate of potassium. Five grains of this solution diluted, required sixty-eight grains of the test liquor, a preliminary trial having been made to get an idea of the strength of the solution. Then as 68 grs. of test liquor represent ·36312 gr. of aconitia present in 5 grains of the solution of sulphate of aconitia, therefore 585 grains equal 42·483 grs. of aconitia from 5000 grains of the root, or nearly 0·85 per cent. ($585 \div 5 = 117 \times {\cdot}36312 = 42{\cdot}483$.)

The residual liquor after the extraction of the aconitia, was then treated with an ounce of chloroform and a little more ammonia, but owing to the ether present and the density of the extractive solution it did not separate. To effect its separation, sufficient ether was added to make the mixed chloroform and ether lighter than the extractive solution, when it was decanted, evaporated, and heated with a fluidounce of water. The addition of diluted sulphuric acid liberated a bulky hydrated oleoresinous precipitate which, on standing, gradually lost its water

of hydration and assumed a soft consistence, staining paper. The liquor from this precipitate, with its washings, was tested for aconitia, and 4·065 grs. more of the alkaloid indicated, making the whole according to Mayer's test 46·56 grs.*

European Aconite Root.

A parallel experiment was now tried with European aconite root of German origin; 5000 grains of this root, in moderately fine powder, were treated in a similar manner with alcohol sp. gr. ·835. The liquor concentrated to three fluidounces mixed with a quantity of diluted sulphuric acid, equal to that employed in the first experiment, and then washed with ether until the latter ceased to be colored. The aconitic liquid separated from the ether was mixed with an excess of ammonia and again treated with ether till exhausted. The ethereal liquids left, on evaporation in a capsule, 30 grains of soft brown residue strongly alkaline to test paper. This, when treated with a fluidounce of water, and sufficient diluted sulphuric acid, all dissolved but a trace, showing that the more thorough preliminary washing in this instance had removed all the oleoresin. The impure solution of sulphate of aconitia weighed 686 grains. Five grains of this required 30 grs. of test liquor to saturate it. $686 \div 5 = 137 \times 0{\cdot}1602 = 21{\cdot}94$ grains.

The residual aconite liquor was treated with chloroform, ammonia and ether, as in the other experiment. A few grains of soft extract only were obtained, exhibiting, when properly treated, but a faint cloudiness with the test solution for aconitia.

The ethereal washing liquids containing fixed oil and resin were separately evaporated. The product from the American root, amounted to 114 grains; whilst that from the European root equalled 180 grains.

The two solutions of sulphate of aconitia were now treated to isolate the alkaloid. That from the European root was carefully precipitated by ammonia, the precipitate collected on a filter, washed and dried. It weighed *ten* grains.

* The reader will observe that Prof. Mayer's test indicates twice as much aconitia as was obtained by experiment. I am unable to account for this, unless by inferring an error in Prof. Mayer's numbers.—W. P., Jr.

The solution from the American root was then precipitated by ammonia, and the liquid and precipitate washed with ether to remove the aconitia. The ethereal liquid, on evaporation, left the aconitia somewhat gelatinous, and on standing, decided evidences of crystallization were manifested. Most of the alkaloid dried in a resin-like form of a yellowish color, which, in powder, had a light straw-color, and weighed 21 grs.

It now remains to remark on the feasibility of cultivating aconite root in the United States with a view to commercial supply. The following statements are derived mainly from a letter from Messrs. Tilden & Co., of New Lebanon, Columbia county, N. Y., who for years past have cultivated this plant for the leaves. They raise aconite from the seed sown in drill; after the first year, the plants are separated and set out in rows, nine to twelve inches apart, in good soil. It has been found most successful to reset one-third of the plants every year. When two years old the tops may be used in medicine, but the roots should not be employed until they are three or four years old. The specimen submitted with this report is not so large as the European root of commerce. One of the average roots weighs only forty grains. Supposing that forty thousands of these were raised on an acre of good soil, ($40000 \times 40 \div 7000 = 228$) the produce would be only 228 pounds avoirdupois. But it is quite probable that, with more age and favorable conditions, the yield would be at least twice as large, or about 500 pounds per acre, as in the sample of European Root used the roots averaged nearly 80 grains.

Aconite has fewer enemies among the insect tribes than any of the ordinary narcotics or sedatives, not being preyed on by the slug, so destructive to hyoscyamus and belladonna. The soil should be deep and well manured with animal manure, and the plantation kept clean. The roots should be dug late in the fall, and then thoroughly dried.

From the foregoing parallel experiments, it would appear that Aconite roots grown in this country are stronger in aconitia than are the commercial European roots. The sample of European Aconite used was, so far as could be judged by external appearance, a fair specimen, and medicinally had given satisfaction. In

all the papers that I have examined, from that of the discovery of aconitia by Brandes, about 1821, to that of Geiger and Hesse, in 1832, and Von Planta, 1852, none give the per centage strength of aconite root, and hence I have no data to decide upon the normal per centage of the drug. The experiments were conducted with entire fairness, and as nearly parallel as is usual in such investigations.—*Proc. Amer. Pharm. Assoc.*, 1863.

Philadelphia, Sept. 5th, 1863.

COPAIBA CAPSULES.

36 *Platt Street, New York, Nov. 16th*, 1863.

To the Editor:—

Dear Sir:—As many inquiries have been made as to the proportions of Copaiba and of Oil of Cubebs in the capsules of Balsam of Copaiba and oil of Cubebs, as prepared by me, I wish you would be so kind as to publish the subjoined formula in your valuable paper, so as the profession and trade will know what they are.

I take of

Pure Balsam Copaiba, nine troyounces,
Ess. Oil of Cubebs, one " "

To be divided into 480 capsules, each capsule containing gr. ix. of Balsam, and gr. i. of Ess. Oil of Cubebs.

The capsules are made of sweetened gelatin, after the following proportions:

Refined Gelatin, 95 per cent.,
White Sugar, 5 "
Water, S. Q.

The "modus operandi" for making these capsules is known to every druggist, as described in the U. S. Dispensatory, and other formularies, by dipping metallic oval rods in the dissolved gelatin, and allowing it to cool on the rods, when they are taken off and filled with a blow-pipe.

E. QUERU,
Chemist and Pharmaceutist.

NOTE ON SOME PROPERTIES OF BERBERINA.

By William Procter, Jr.

Having occasion recently for information relative to the properties of pure berberina in an uncombined state, a reference to all the authorities at my disposal, including nearly all the papers published within the last few years, I noticed with some surprise that these writers, in describing berberina, treated the substance obtained from Berberis vulgaris by the agency of neutral solvents, and which, as Berberin is an alkaloid, must be a natural salt of that substance.

Buchner, the original discoverer of this principle, believed it to be a neutral substance. Liebig (Traité de chimie, tome ii. 645,) says it is alkaline, but in describing its preparation gives the original process, and describes its solubility in the form of its natural salt, as requiring 500 parts of cold water. Wittstein, in his "Practical Pharmaceutical Chemistry," (Darby's translation), also describes it in this condition as obtained by neutral solvents, and gives the same numbers for solubility that Liebig does. He also says that this natural salt is the *hydrochlorate*, a statement I have not seen elsewhere. I have consulted the papers of Fleitman, of Stenhouse and of Perrins, in the Pharmaceutical Journal, and those of Mahla and Merrill in this Journal, and none of them describe the properties of pure berberina.

The best process for isolating berberina is that hinted at by William A. Merrill, (Amer. Jour. Pharm., page 503, 1862), based on the separation of the sulphuric acid from the sulphate by either baryta or oxide of lead. Mr. Merrill prefers the oxide of lead, and I agree with him, as, from its insolubility in water, its excess does not interfere with the purity of the resulting alkaloid in solution.

Take the root of Hydrastis canadensis, or of Berberis vulgaris, preferably the former, in coarse powder, exhaust it by repeated decoction or digestion in boiling water, and evaporate the filtered liquids to a soft extract. Treat this with stronger alcohol by digestion in a water-bath still at several times until it is exhausted (or until a quart of alcohol has been employed for

the extract from each pound of the root). Add to the tincture one-fourth of its bulk of water, distill off five-sixths of the alcohol, and add to the hot watery residue an excess of diluted sulphuric acid, and allow it to cool. The sulphate of berberina crystallizes out, and, if necessary, may be drained from the mother-liquid, re-dissolved in the smallest quantity of boiling water, and again crystallized.

The salt is now ready for decomposition by oxide of lead. The latter, as obtained by precipitation from the acetate or nitrate of lead by liquor potassæ, and well washed, and is added in excess, with agitation, to the sulphate of berberina dissolved in boiling water, the solution being kept hot during the decomposition. When a drop of the hot clear liquid will not be precipitated by baryta water or acetate of lead, the digestion is finished. The solution should then be filtered off hot, evaporated, and set aside for crystallization.

Examined by a lens, berberina crystallizes in stellated groups of minute acicular crystals, not so deep in color as those of the muriate of commerce, or Eclectic *hydrastin*. A grain of berberina, placed in a test tube, was shaken with repeated additions of water at about 60° F., with intervals of rest, during twenty-four hours, until it had nearly all dissolved,—which required 75 grains of water. The residue completely dissolved when the quantity was increased to 100 grains. The solution thus obtained was a clear and brilliant yellow color. When a grain is dissolved by heat in 75 grains of water, the excess crystallizes out on standing. Berberina is much more soluble in boiling water, and in hot alcohol, but it is less soluble in cold alcohol than in water, one grain requiring more than 100 grains of that liquid for solution. Storer, in his "Dictionary of Solubilities," page 67, gives Liebig's numbers for the solubility of berberin, which apply to its hydrochlorate according to Wittstein. It is soluble in acetone and methylic alcohol, whilst chloroform dissolves it but slightly, and ether, oil of turpentine, and oil of almonds, not at all. Acetic acid is one of its best solvents. It is also soluble in cold sulphuric acid, which it colors deep yellow. Nitric acid instantly decomposes berberina, with the production of a dark mulberry-purple color, which

grows lighter by standing. This reaction is best shown by adding a minute fragment of nitrate of potassa to the solution of berberina in sulphuric acid, when the rich mulberry color is instantly developed.

When a particle of bichromate of potassa is employed, the color is much darker, almost purplish-black and remains so for some time. The saturated aqueous solution yields beautiful crystalline precipitates, with diluted nitric, muriatic, and sulphuric acids, but not with phosphoric acetic, citric, or tartaric acids. Aqueous iodine renders it opaque, and affords a brown precipitate; tannic acid and iodohydrargyrate of potassium, each a yellow one.

Both the watery and alcoholic solutions have a strong bitter taste. The existence of berberina in several of the natural orders of plants is quite remarkable, and suggests to Mr. Perrins that it probably possesses more valuable properties as a medicine than have yet been accorded to it.

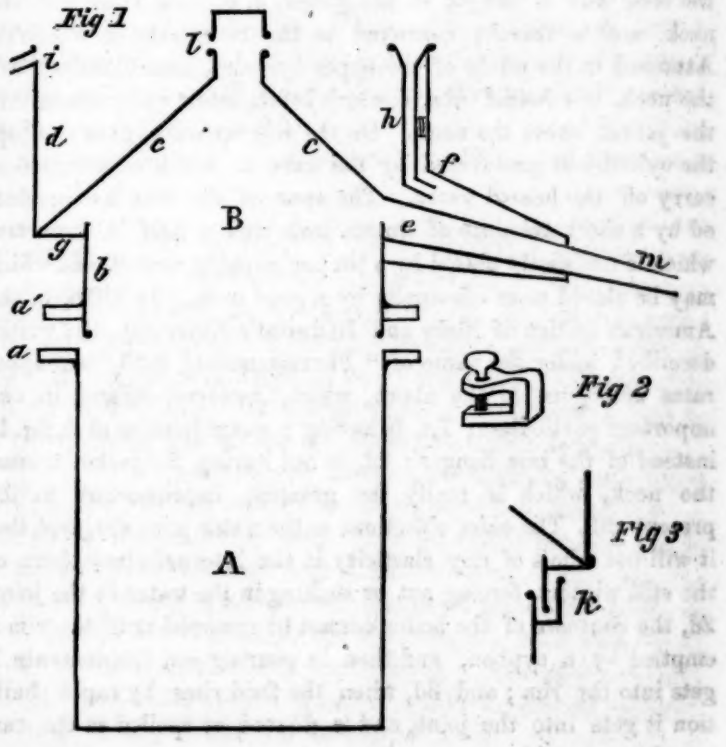
ON A STILL FOR APOTHECARIES.

By William, Procter, Jr.

At the meeting of our Association in 1862 the following question was proposed and accepted: "What is the best form and material for a still for use by pharmaceutists, of from two to four gallons capacity, appropriate for being heated by gas or stove heat, and which shall be suitable for the recovery of alcohol in making pharmaceutical preparations."

In replying to this query, I will reverse the order and speak of the material first. Tinned copper is, by far, the best material for a still, lasting much longer and capable, by retinning, of being frequently restored to its original condition; but owing to the high price of copper, the cost forms an objection that would prevent the general use of the apparatus. Tinned iron is, therefore, the material here suggested, which, with due care, will last a long time for liquids which do not attack the metal. The strongest objection to it is, perhaps, the fact that astringent solutions gradually work their way through the imperfections of the tinned surface, and are blackened by contact with the iron

beneath. As the most expensive portion of the still is its condensing head, which does not come in contact with the liquid, a compromise may be made in regard to material by constructing the boiler of copper, and the condenser of tinned iron. In regard to the form of the still, the accompanying diagram will convey a correct idea to the reader, but to illustrate it to the members present I have had a tinned-iron still made, which will be better understood by a few explanations of the diagram. This still consists of two distinct parts, the boiler, A, and the condensing head, B. The former is cylindrical, 12 inches deep, 10 inches in



diameter, with a tinned wrought iron flange, *a*, an inch wide, and a quarter of an inch thick. A similar tinned iron flange, *á*, is attached to the base of the head, which fits on the flange of the

boiler, and forms a tight joint by means of twine or gum-packing, when held together with clamps. Rising from this is a cylinder of tinned iron, *b*, three inches high, which is surmounted by the conical condensing surface, *c*; united by means of a horizontal ring with the cylinder before mentioned. On the outside of the cone, and rising from its base, is another cylinder, *d*, which forms the receptacle for the refrigerating water. Passing out from the conical condenser is a tubular neck, *e*, ten inches long, surrounded for three-fifths of its length with a jacket, *f*, which opens into the receptacle for water. The neck is attached to the head so that all the liquid that condenses on the inside of the cone and is caught in the gutter, *g*, at once runs into the neck, and is thereby conveyed to the receptacle or receiver. Attached to the inside of the upper cylinder, immediately above the neck, is a funnel tube, *h*, which bends below and projects into the jacket, above the neck. On the side opposite, near the top, the cylinder is penetrated by the tube *i*, which is intended to carry off the heated water. The apex of the cone is surmounted by a short tubulure of tin an inch and a half in diameter, which is ordinarily closed by a tin cap slipping over it, and which may be closed more effectually by a good cork. In 1848, in the American edition of Mohr and Redwood's Pharmacy, the writer described under the name of "Pharmaceutical Still," an apparatus analogous to the above, which, however, differed in two important particulars: 1st, in having a water joint as at *k*, fig. 2, instead of the iron flanges; 2d, in not having the jacket around the neck, which is really the greatest improvement in the present still. The chief objections to the water joint are, *first*, that it will not admit of any elasticity in the internal atmosphere of the still without forcing out or sucking in the water in the joint; 2d, the contents of the boiler cannot be removed until the rim is emptied by a syphon, and then in pouring out the contents it gets into the rim; and 3d, when the fluid rises by rapid ebullition it gets into the joint, and is diluted or spoiled as the case may be.

It now remains to speak of the manner of using this alembic, and of making the joint tight. After charging the boiler

the operator extends a piece of moist, loose textured, coarse twine, around the centre of the iron flange, crossing the ends. The head is then placed in position, and by the aid of five clamps, see fig. 2, the flanges are compressed strongly together, when the twine forms an air-tight joint; of course, a ring of rubber would be more elegant, but scarcely more effective, and by no means so convenient and economical. This simple idea I owe to a recent visit to the laboratory of Dr. E. R. Squibb, who gave me permission to use and describe it. When in operation, the boiler should be supported in a jacket, as, for instance, the top of a common cylindrical stove, by means of a ring of sheet iron pressing against the lower side of the clamps. A current of cold water is allowed to run into *h*, which carries it directly to the neck, where the largest amount of vapor is to be condensed, and which should be kept cooler than any other part of the condensing surface. The tubulure at *f* enables the operator to inspect the interior, by means of a glass or wooden rod. A gum tube will convey the waste water away from *i*. In distilling very volatile liquids a Liebig's or other condenser may be attached to the neck, at *m*, if it is deemed advisable. Gas heat is admirably adapted for this still when used with a jacket, and when the distillation of alcoholic solutions is carried nearly to dryness, a water bath jacket may be employed. Of course, in using this still for recovering ether, every precaution should be taken as regards tight joints and effectual condensation—using a water bath heat, and ice water in the condenser, the neck being luted to the receiver, which, of course, should be ventilated by a small opening to prevent accidents. The tubulure, in this case, should be well closed with a good velvet cork. The apparatus exhibited cost eleven dollars, but this great price arose from the clamps and tinned flanges, which, were the apparatus much used, could be made much more cheaply. This still was constructed by Mr. Isaac S. Williams, 726 Market street, Philadelphia.—*Proc. Amer. Pharm. Assoc.*, 1863.

Philadelphia, Sept. 5th, 1863.

GLEANINGS FROM THE FRENCH JOURNALS.

By the Editor.

On Syrup and Extract of Cinchona of normal strength.—M. Guilliermond, in an elaborate paper on this subject, proposes to make a normal or uniform alcoholic extract of cinchona which shall contain about one-sixth of quinia or in the ratio of 32 grammes of sulphate of quinia from each kilogramme of cinchona. This will make it necessary to use only the better quality of cinchona, and where the percentage strength is less than 3·2 percent. of sulphate of quinia; he proposes to mix richer barks with the weaker so as to make the average. M. Guilliermond finds that when such bark is extracted with alcohol of 80 per cent., it yields about one-fifth of its weight of extract, and this extract is the preparation from which he proposes to make his normal syrup of cinchona, such extract containing about 15 percent. of quinia.

To make the syrup, the following recipe is recommended: White Spanish wine, 500 grammes; sugar, 500 grammes; alcoholic extract of cinchona, 10 grammes. The extract is first dissolved in the wine and the sugar afterwards. The syrup has about three-quarters of a grain of quinia for each fluidounce.

The idea of graduating the strength of galenical preparations by preliminary testing, has been repeatedly brought forwards, but the impracticability of recipes thus constructed, except in expert hands renders their general adoption inexpedient. The irregularity in the composition of even the better class of cinchona barks is sufficiently great without combatting that of the inferior grades. M. Guilliermond concludes his paper with a tabular view of the strength of the several commercial cinchona barks enumerated, which must only relate to the particular specimens examined, and not to all the samples of each particular kind.

	yields.	per ct.
Flat Calisaya without epidermis	3·	to 3·2
Quill Calisaya with epidermis	1·5	to 2·
Flat Carabaya bark of Peru without epidermis	1·5	to 1·8
Quill Carabaya bark of Peru with epidermis	·8	to 1·0
Flat red Cusco bark without epidermis	·4	
Quill red Cusco bark with epidermis	·0	

	yields.	per ct
Flat Huanuco bark, flat, without epidermis	·6	
Pale-yellow Huanuco bark	·6	
Quill Huanuco bark	·2	
Cinchona of Jaen (Peru)	1·0	
Bright-red Cinchona	2·0	to 2·5
Pale-red Cinchona	1·5	to 1·8
Fine gray Loxa bark (Condamine)	·8	
Fine gray Loxa bark (Negrilla)	·2	
Yellow Guayaquil bark	·3	to ·4
Quilled orange-yellow bark of New Grenada	1·8	
Yellow Calisaya bark of Bogota	3·0	to 3·2
Pitaya bark	2·0	to 2·5
Ligneous Carthagena bark	2·0	
Orange-yellow bark of Mutis	1·5	to 1·6
Red bark of Mutis	1·2	to 1·4
Yellow bark of Mutis	1·2	to 1·4
Rose-colored Cinchona of New Grenada	1·8	
Maracaibo bark	0·3	to 0·4
Inferior Cusco bark	0·05	
Inferior barks from Lagos	0·06	
Inferior barks from Equador	0·06	
Inferior pale-red bark of New Grenada	0·018	
Inferior white bark of New Grenada	0·006	

Tannate of Quinia.—M. D. Smedt (Jour. d'Anvers) states that the usual method of obtaining this salt is to decompose a solution of acetate of quinia with a solution of tannin. But it is found that a large excess of tannin is required, which M. Smedt considers to be due to the influence of the acetic acid thrown out of combination. To prevent this interference, he proposes to carefully saturate the tannin with ammonia, so that the reaction shall be between tannate of ammonia and acetate of quinine, which prevents all difficulty. The precipitated tannate is washed with water and dried.

Tannate of quinia is employed in infantile cases, where the sulphate has a harsh action on the stomach and bowels.—*Jour. de Pharm., Aout.*, 1863.

On the preparation of Lemon Syrup.—M. Timbalagrave offers the following as an improved recipe for lemon syrup:

Take about twenty-five lemons, remove the exterior yellow

oil-cells and their contents by grating, avoiding as far as possible the white part of the rind. The zestes of the lemons thus obtained are placed in a bottle and two kilogrammes of simple syrup (3½ pints), and leave them in contact four days, with occasional agitation, when the whole is added to 18 kilogrammes (31½ pints) of boiling simple syrup and strained. When cold, add 50 grammes (13 drachms) of citric acid dissolved in an equal weight of water, and mix them.

This process, according to the author, gives a product having a very agreeable aromatic taste, which it preserves a long time. Lemonade prepared with this syrup can be kept during five or six months without alteration.

The aromatic syrup can be prepared in the season when lemons are plenty, as it keeps well. Syrup of oranges may be prepared by a similar process.—*Jour. de Pharm. de Toulouse* and *Jour. de Pharm.*

Test for Chloroform.—M. Hardy states that sodium, when dried by wiping it with unsized paper, does not act on chloroform if pure, but when it contains alcohol or ether there is a disengagement of hydrogen. This reaction occurs without heat, and almost instantaneously.—*Jour. de Phar.*

Process for bleaching Gutta percha.—Dissolve the gutta percha in twenty times its weight of boiling benzole, add to the solution plaster of very good quality, and agitate the mixture from time to time. By reposing for two days the plaster is deposited, and carries down with it all the impurities of the gutta percha, insoluble in benzole. The clear liquid decanted, is introduced by small portions at a time into twice its volume of alcohol, 90 per cent., agitating continually. During this operation the gutta percha is precipitated in the state of a pasty mass, perfectly white. The desiccation of the gutta percha, thus purified, requires several weeks' exposure to the air, but may be accelerated by trituration in a mortar, which liberates moisture which it tends to retain.—*Jour. de Pharm., Aout.*, 1863.

On soluble Citrate of Magnesia.—M. Hager has not been able to obtain a soluble citrate of magnesia by the process of

M. de Letter (see this Journal, page 312, 1863), which has in his hands produced the insoluble modification of the citrate of magnesia. The author's study of the subject has satisfied him that citrate of magnesia can present three distinct modifications:

1st. *Crystalline*, soluble in 80 to 90 parts of water (Ci. 3 MgO. + 14HO;

2d. *Amorphous*, soluble in two parts of water;

3d. *Metamorphous*, soluble in eight or ten parts of water, and having a very great tendency to assume the crystalline condition.

It is this crystalline modification which constitutes the insoluble citrate, and which presents the form of microscopic needles, derived from a right rhomboidal prism. Its production constitutes an embarrasment which ought to be avoided, since it is only the soluble citrate that is intended to be used.

M. Hager prepares it as follows:

Forty parts of citric acid of commerce is reduced to powder, then mixed with 25 parts of carbonate of magnesia of the shops, also in powder, and sufficient alcohol of sp. gr. ·833 is added to make a thick mixture. The whole is allowed to stand for several hours at a medium temperature, after which it is dried in a stove or in a water-bath at the temperature of 113° F.

The dry residue is the product sought. It is soluble in two parts-and-a-half of water at 60° F. by standing half an hour, but at a temperature of 86° F. it dissolves at once.

Whether it has been prepared hot or cold, with little or much water, the solution preserves its clearness even after long standing. The citrate that it contains is neutral, and two assays gave 12·7 and 13·1 eq. of water.

To obtain the soluble citrate without doubt, it is necessary that the carbonate of magnesia employed be exempt from dust and impurities; and further, that as this salt [the carbonate] has not always the same composition, it is safer to make a preliminary assay to determine the proportions of acid and carbonate to be employed. According to the author, 25 of carbonate to 40 of acid is a mean proportion.

The *metamorphous* salt is always produced by the process of M. Dorvault [by fusing the acid with a little water, and ad-

ding calcined magnesia.]—*Pharm. Centralhalle* and *Jour. de Pharm.*

Caffeidin, a new base derived from Caffein.—M. Strecker, in submitting a concentrated aqueous solution of caffein to distillation with a hot saturated solution of baryta, obtained water, ammonia, and methylamine, which M. Wurtz has already obtained by means of potassa and caffein. In the fixed residue in the retort M. Strecker has found carbonate of baryta as well as *caffeidin*, a new base.

After filtering and neutralizing with sulphuric acid, the liquid is evaporated in a water-bath, which yields colorless needles, which are increased in quantity by adding alcohol to the mother-liquid. These crystals are the sulphate of caffeidin, very soluble in water, and not precipitated by potassa or ammonia in solution.

Solid potassa separates from its solution oily drops, not crystallizable, but soluble in water, and alcohol. Ether dissolves it but slightly.

This oily liquid constitutes *caffeidin*, $C_{14}H_{12}N_4O_2$. It is not volatile, and loses nothing at 212° F.—*Jour. de Pharm., Sept.*, 1863.

Compound of Quinia and Oil of Anise.—M. Hesse, in dissolving five parts of quinia and one part of oil of anise in boiling alcohol, found that brilliant crystals are deposited, derived from an oblique prism, the composition of which accords with the formula $2(C_{40}H_{24}N_2O_4) + C_{20}H_{12}O_2 + HO$. Without odor at common temperatures, they smell of anise only at 230° F. when decomposition commences. This compound is very soluble in ether, but is insoluble in water, cold or hot, but fuses at the temperature of boiling water.

The author has not succeeded in effecting similar compounds of quinia with phenic acid, creasote or essence of mint, roses, and cummin.—*Jour.de Pharm., Sept.*, 1863.

New Collodion, soluble without Ether. By M. Sutton.—The pyroxylin employed for this preparation is soluble in alcohol, and is obtained in the following manner: throw into a porcelain vessel of the capacity of 700 grammes, about 100 grammes (1543 grs. troy) of sulphuric acid of sp. gr. 1·83, and add to it

80 grammes of nitric acid, of sp. gr. 1·4. The porcelain vessel is set in another of boiling water, and when the mixture has attained a temperature of about 170° F., the cotton well carded and of the best quality, is added in quantity sufficient to fill the liquid with which it is left in contact five minutes.

The liquid is then rapidly decanted, the pyroxylin thrown into a vessel of water and washed with repeated portions of water, and then macerated for a night in water, then rinsed again, pressed and dried.

The success of the operation depends on the strength of the acids as indicated. The pyroxylin obtained is very short, and in the form of coarse powder; hence the washing requires care to avoid loss. When it is dry it is put in a bottle, with sufficient alcohol to cover it. Shake the bottle occasionally until a thick solution is obtained, which is preserved for use.—*Jour. de Pharm.*

On the Silica in Commercial Potash. By M. Rieckher.—The purified carbonate of potassa retains, as is well known, a certain quantity of silica, which causes its solution to become cloudy by standing.

Two means have been proposed for removing the silica: the first by M. Mohr, which consists in evaporating the solution till the carbonate crystallizes, when the silica and chloride remain in the mother-water.

M. Rieckher proposes to evaporate to dryness the solution of carbonate of potassa, and which should be free from sulphate. After cooling, the residue is moistened with carbonate of ammonia and evaporated again. The silica passes to the insoluble modification by aid of the temperature necessary for evaporation. By again dissolving and filtering, the carbonate is obtained free from silica.—*Jour. de Chim. Méd., Nov.*, 1863.

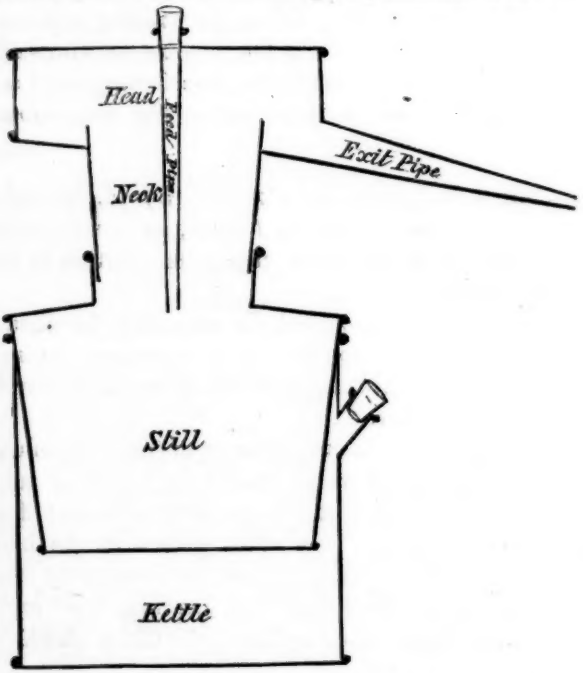
New Rat Poison.—The *Journal d'Agriculture Pratique* recommends artificial carbonate of baryta for the destruction of rats. This tasteless salt can be mixed with different aliments; it does not become poisonous until after the action of the gastric juice has given rise to soluble salts of baryta.—*Jour. de Chim. Méd., Nov.*, 1863.

ON THE MOST DESIRABLE FORM FOR A STILL FOR PHARMACEUTICAL PURPOSES.

By Thomas S. Wiegand.

Among the subjects to be reported upon at the meeting of our Association in 1862, was the most desirable form for a pharmaceutic still.

As the engagements of the member to whom it was referred prevented his reporting upon it, the subject was dropped at his request; this is especially to be regretted at the present time, as the high price of alcohol, and the introduction of so many fluid extracts into the Pharmacopœia, renders it more important than ever for the trade to recover it wherever practicable to do so. It was hoped by those of us who are familiar with the thorough manner in which Dr. Squibb does whatever he undertakes, that we should have a plan from him for a still that would combine the various requirements of our trade in an eminent degree. Without claiming to have succeeded in producing the most desirable apparatus, I think the experience of



more than two years with one very similar to that here described, enables me to recommend it as being very nearly what is required by the great majority of pharmaceutists. In arranging its several parts, the facility of cleaning it has been regarded as very important, and it is so designed that any good tinsmith can make it, while the usual pattern of copper stills requires a coppersmith to execute them.

The whole apparatus is made of sheet copper thoroughly tinned inside, the mouth of the still being large enough to admit the hand being introduced to clean it; the neck is made with a taper, so that it will close tightly, and of sufficient length to prevent the foaming, which frequently occurs, rendering the distillate impure; the neck is continued up into the head of the still a quarter of an inch to prevent the condensed liquor which forms in the head of the still flowing back into the still; the feed pipe enables the operator to continue the process with less interruption than would occur if the head were removed each time a new charge was added. As nearly all the use of the still in the hands of the apothecary is to recover alcohol from various preparations, it is desirable to have a safe means of applying heat: this can be done with great facility by means of a kettle, the diameter of which is a little less than the still at the shoulder, so that the still will form a close junction with it and prevent the free escape of steam. A still of this kind and size here described can be made for about four and a half dollars, the kettle for about two dollars more. It is far more economical to have them all made of copper tinned, as there is very little wear upon copper utensils, while the common, substitute, sheet tin, corrodes so quickly that in a short time a greater expense is incurred than would be required for copper vessels.

Proc. Amer. Pharm. Association, 1863.

ON THE ACTION OF SULPHUR ON AMMONIA.

By F. A. Flückiger.

Gmelin and Rose state that pure sulphur has no action on ammonia; Brunner, however, has shown that ammonia water dissolves a little sulphur. Dry gaseous ammonia and vapors of sulphur, passed through a red-hot tube, yield, according to Thé-

nard and Fourcroy, a mixture of different sulphurets. My own experiments show that no reaction takes place if sulphur is heated in gaseous ammonia merely to the point of volatilization.

Brunner's statements are correct. At ordinary temperature no solution is obtained, but at 60 to 65° C. the ammonia water is colored light lemon-yellow and precipitates, subsequently, in contact with the air, a minute portion of sulphur in an amorphous state, and too little to be weighed from 100 grammes of ammonia. The solution remains yellow if the air is absolutely excluded, but is not colored by nitro-prusside of sodium, and by plumbate of soda only faint reddish; it contains no sulphuret except a trace, after standing for several months hermetically sealed. If a large quantity of such an ammoniacal solution of sulphur is evaporated to dryness, and the residue treated with a little water, the filtrate shows all the reactions of a hyposulphite. Crystallized hyposulphite of ammonia, dissolved in water and boiled with sulphur, yields no yellow solution; the ammonia water must therefore be capable to dissolve a little sulphur at and above 60° C. This solution is altered in contact with the air the same as solutions of a sulphuret; sulphur is precipitated; another portion oxidized to S_2O_2.

The ammonia water used in the experiments above was prepared by the author, and perfectly pure. The flowers of sulphur, a commercial article, was washed with much distilled water, and the acid filtrate considerably concentrated, when it produced, with nitrate of silver, at once a purely white precipitate, which readily turned yellowish, brown, and finally black. The other usual reagents for hyposulphurous acid likewise proved its presence. This observation is remarkable, considering the instability of this acid, and proves the correctness of Rose's statement, that small portions of it may withstand decomposition for some time; in fact, it appears to keep unaltered for any length of time in commercial flowers of sulphur, if it is not reproduced in them.

Another experiment indicates a greater stability of hyposulphurous acid. A mixture of finely divided cadmium, sulphuret of cadmium, and pure sulphur, is well agitated with absolute alcohol and sulphurous acid; after the removal of the excess of

the latter by evaporation, and of cadmium by sulphuretted hydrogen, the filtrate gives with lead a pure white, and with silver a white precipitate turning black. This reaction was observed after five months, but ceased to be produced after another month. Pentathionic acid, which might likewise have been formed, precipitates silver salt yellow.

The experiment with flowers of sulphur was repeatedly made. The wash-water, after careful concentration in a water-bath, yields with absolute alcohol a precipitate of a little gypsum and sulphate of ammonia; by the addition of ammonia, some ferric oxide is frequently precipitated. If this is omitted, and the evaporation continued to dryness, the hyposulphurous acid will be decomposed by the free sulphuric acid, which likewise blackens the residue from the presence of some organic impurities, and lime evolves ammonia, so that flowers of sulphur must contain a small proportion of an ammoniacal salt.

Hyposulphurous acid may frequently be detected even in well washed flowers of sulphur, also in sublimed or precipitated sulphur after crystallization from bisulphuret of carbon; even roll sulphur is not free from it and sulphuric acid, so that absolute purity of sulphur is not easily attained.

The hyposulphurous acid S_2O_2, being the lowest oxide, may probably originate by direct oxidation; the author, however, has been unable to obtain it by exposing pure sulphur to ozone (from KO, Mn_2O_7,) and to chlorine water, by slowly burning sulphur in a moist atmosphere, by evaporating water from it for several days, and by the spontaneous decomposition of solution of sulphuretted hydrogen. Still, it is possible that these experiments were undertaken on too small a scale, or not continued sufficiently long.

Hyposulphites, if searched for, will probably be frequently detected in natural products. Until now, hyposulphurous acid has been discovered only by Fellenberg, in 1849, in the water of the Gurnigel, in Switzerland, by Péligot, in the celebrated spring of Grenelle, and by Wittstein, in 1857, in the sulphur spring of Alle Prese, near Poschiavo.

Distilled water, enclosed with pure sulphurous acid and milk of sulphur in a sealed glass tube, and heated for several days to between 80 and 90° C., contains hyposulphurous acid; the same

is found in water containing milk of sulphur in suspension, through which washed sulphurous acid is passed for some time. This proves the possibility of the formation of this acid by the simple addition of S to SO_2, and under conditions which are found still more favorable in the solfataras, lava, &c., of volcanic regions.

It remained now to be shown whether the hyposulphurous acid of the solution of sulphur in ammonia is formed by this reaction, or is merely dissolved out of the sulphur. But pure crystallized sulphur forms, under these circumstances, traces of hyposulphurous acid, more if the solution was effected in sealed tubes. Water of ammonia of ·885 sp. gr., heated to 90 or 100° C. in nearly filled glass tubes, with about one-third its weight of sulphur, soon turns deep brown-yellow, the sulphur disappears slowly, and saturation is attained if the liquid separates in the cold some octohedrons of sulphur. A brownish-red liquid, very dark at a higher temperature, is the result, which, like bisulphuret of chlorine (S_2Cl), extinguishes all the colors of the solar spectrum except red and orange, and separates slowly a little very fine carbonaceous matter. The solution smells chiefly of ammonia, and does not fume in contact with the air.

On opening the tube, a slight diminution of the tension is observed, and after pouring it out, the liquid almost solidifies from crystallizing sulphur. By the addition of water, or from a more diluted water of ammonia, a milky separation of sulphur takes place; but the liquid retains a brown-yellow color, and the separated sulphur is soluble in bisulphuret of carbon. If the concentrated solution is mixed with absolute alcohol, crystalline laminæ are separated in a short time, and the decanted liquor separates into a colorless supernatant and a lower red-yellow layer, which gradually deposits long needles, consisting of pure sulphur in a colorless state, and assuming the usual color by the application of heat. The mother-liquor from these crystals retains its red-yellow color much longer than the pure aqueous solution. The original solution, mixed with much alcohol and slightly heated in a retort, evolves hydrosulphate of ammonia, (most likely NH_3, 2HS,) which sometimes crystallizes in the neck in long colorless needles of little stability.

The solution obtained in a sealed tube, as stated above,

whether saturated or not, containing little or much sulphur, yields a very intense coloration with nitro-prusside of sodium, and contains, even if very little sulphur has been used, principally higher sulphides of ammonium (NH_4S_5, and NH_4S_7); for it always gives the reactions of the polysulphides (see Am. Jour. Ph., 1861, 264), modified by the excess of ammonia.

The above saturated solution of sulphur, rapidly evaporated in a water-bath, leaves a yellowish residue of one-fourth its weight. Water leaves sulphur, and dissolves 30 to 32 per ct. of hyposulphite of ammonia 3 (NH_4O,S_2O_2) + aq., the same salt that is precipitated by absolute alcohol from the fresh solution. It differs from Rammelsberg's salt of the same composition* by being less deliquescent, and by precipitating salts of baryta only after slight acidulation.

The reaction of sulphur on ammonia at 100° C. is probably as follows: 3 (NH_3 + HO) + xS = NH_4O,S_2O_2 + NH_4S_5 + NH_4S_7 + S (sulphur in simple solution). It may vary with the concentration of the ammonia and the duration and temperature of the process, but the oxygen for forming S_2O_2 is undoubtedly derived from the oxide of ammonium. The solution of sulphur is effected by ammonia, but may be aided by the newly formed compounds. The saturated solution in ammonia of ·885 sp. gr. yields, by rapid evaporation, 7·7 per cent. of its weight of hyposulphite. The author suggests that this method of preparing hyposulphite might perhaps be profitably employed for technical purposes.

Under favorable circumstances, the behaviour of sulphur and ammonia to each other is identical with that of the other hydrated alkalies; and the formation of hyposulphite must be expected wherever sulphur and ammonia act on each other. If well crystallized 3NaS + AsS_5 + 15 aq. is decomposed by acetic acid, and the precipitated AsS_5 carefully washed, it is wholly soluble in ammonia, but the solution soon separates sul-

* Rammelsberg obtained 41·5 per cent., Fluckiger 39·07 per cent., of Sulphur. The formula 3 (NH_4O,S_2O_2) + aq., requires 41.12 per cent S; 2 (NH_4O,S_2O_2) + aq., contains 40·77 S and NH^4O,S_2O_2 + aq., 38·55 S, while Arppe's anhydrous salt NH_4O,S_2O_2 requires 43·24 S. Fluckiger's salt is, therefore, probably the monohydrated hyposulphite of ammonia.

J. M. M.

phur; if evaporated, water dissolves from the residue hyposulphite, besides arsenite of ammonia.

Absolute alcohol saturated with ammonia, and heated in a sealed tube with sulphur, yields a dark-brown liquid, which has, with nitro-prusside of sodium, but a faint reaction on sulphide of ammonium. On evaporation, colorless or light-greyish crystals with a silvery lustre are obtained, and the mother-liquor evaporated to dryness furnishes a dark-brown residue, from which water takes up only questionable traces of hyposulphite. Its formation is, therefore, prevented by its insolubility in alcohol. The silvery crystals are pure sulphur; under the microscope they prove to be a mixture of a few globules and octohedrons, with thin monoclinic laminæ. Dissolved in bisulphide of carbon and evaporated, the yellow octohedrons are sometimes mixed with others, partly or entirely colorless.

Ammonia has also been treated in sealed tubes with selenium, tellurium, phosphorus and iodine. The former yields a colorless solution of little selenide and selenite; with tellurium, more tellurite of ammonia is obtained.

Amorphous phosphorus is not acted on by ammonia; the ordinary modification yields gradually ammoniated phosphoric oxide and phosphuretted hydrogen. If alcoholic ammonia is used in the experiment, the former is deposited in thin black films of metallic lustre, after drying apparently crystalline, but entirely amorphous under the microscope; thus obtained, it is not decomposed by boiling sulphuric acid or potassa.

Little iodine dissolves readily in ammonia, more yields at first iodide of ammonia, afterwards iodide of nitrogen. The tubes sustain the pressure well enough during heating in the water-bath, but the violent extrication of gas on opening either forces out the contents or fractures the tube.— *Wittstein's Viert. Schr.*, 1863, 321–332. J. M. M.

Berne, Switzerland, April, 1863.

THE GOLDEN PARALLELS.

In the late number of the *Edinburgh Review*, there is a notice of several publications on the subject of gold fields and gold miners. A mass of facts is collected relative to the Australian, California, and Columbian gold diggings, and several important

conclusions are arrived at. In the first place, we are reminded that the great gold fields already discovered are all included within two regions. The gold fields of New South Wales and Victoria extend without any interruption along the slopes of the great mountain range which separates the eastern seaboard of Australia from the interior of the continent, and the gold fields of California and British Columbia occur without interruption along the western slopes of the Rocky Mountains. Thus, there are presented two great gold-bearing regions, extending along two widely distant elevations, and probably "owing their auriferous character to some influence connected with the upheaval." The possibility of establishing a connection between these two gold-bearing regions will be understood after a little consideration of their characteristics. The American gold fields, under various names, run along the eastern seaboard of the Pacific, almost from pole to pole—from Behring's Straits in the north to Cape Horn in the south. Throughout this vast region large quantities of the precious metal are found. "From Chili, in the south, to the British Possessions, in the north, its slopes, spurs, and subordinate ranges are now yielding gold. From Chili we mount through Bolivia, Peru, Equador, New Granada, all still continuing to yield the precious metal, after some three centuries of gold mining. Thence, after we pass the Isthmus, we find the gold miner at work through Mexico, California, Oregon, Washington, till at length we come to the British Possessions, stretching to the shores of the Arctic Ocean." Such is a brief description of the gold-bearing system of America. Turning now to that of Australia, there is found a coast range running from the extreme northern point of the continent to the extreme southern point. But this range neither begins nor terminates in Australia. It extends across Bass' Straits, on the one hand, and beyond Cape York on the other; in which direction the chain of rocks forms at intervals numerous islands, such as New Guinea, the Carolines, the Ladrones, and others, until Japan, with its gold-bearing rocks, is reached. Thus, in accordance with this theory, the basin of the Pacific has on each side a continuous elevation of volcanic origin. At intervals on both sides gold is now found, from Behring's Straits to New Zealand; and it is stated

that at the "beach diggings" in California, a blush sand, not unlike the pipe clay of Ballarat, is frequently thrown up by the waves, and is found to contain gold in considerable quantities.

The conclusion arrived at by this reasoning is that the great gold fields of the world, as at present known, are included in the vast system of volcanic rocks which surround the Pacific. This chain, though broken here and there, is said to be traceable between Australia and America, and to be easy of identification on both sides of the ocean. Such a continuous and well-marked line of volcanic elevation has often received the attention of geologists. Humboldt's view, which is the one generally accepted on the subject, is that the bed of the Pacific attained its present depth at a comparatively late period; that its unbroken crust, pressed down on the molten mass underneath, caused a quantity of it to rush towards the line of fracture at the edges, and that this disturbed matter found vent in the elevations which are now connected with the gold fields of America and Australia. So far these considerations, as bearing on the science of geology, are highly important; but it has to be shown in what way gold is to be connected with volcanic shocks in some places and not in others. On this point it is to be laid down by Sir Roderick Murchison that the rocks which are the most auriferous are of the Silurian age, and that a certain geological zone only in the crust of the globe is auriferous at all. Gold, he states, has never been found in any stratified formations composed of secondary or tertiary deposits, but only in crystalline and palæozoic rocks, or in the drift from those rocks. The most usual original position of the metal is in quartzose veinstones that traverse altered Silurian slates, frequently near their junction with eruptive rocks. Sometimes, however, it is partially diffused through the body of rocks of igneous origin. From this it appears that volcanic eruptions, in connection with Silurian rocks, are to be regarded as the origin of gold formations.

It will have been seen that, according to the volcanic basin theory as described above, the auriferous rocks which surround the Pacific leave Victoria and plunge into the sea to appear again on the other side of Bass' Straits. This would, of course, leave South Australia out of the reach of these gold-bearing

ranges. But singularly enough, the reviewer, after remarking upon this termination of the Victorian rocks, refers to the geological work of Mr. Julian Woods in order to show a curious extension of the volcanic action which is to be "traced in South Australia." On referring to the extract, however, it appears that Mr. Woods' reference is not to South Australia, although it relates to the country close upon its border. Mr. Woods says:—"At about fifty miles east of Mount Gambier, on the Victorian side of the boundary, there commences an immense volcanic district, which may be traced with very little interruption to Geelong by immense masses of trap rock and extinct craters of large dimensions. This kind of country extends considerably to the north of the line, and it is underneath the trap rocks there found at the junction of the Silurian slates and ancient granites that the extensive Australian gold-fields are worked."

Another extract is given from Mr. Woods' book, embodying a statement similar to that which has been already quoted from Sir Roderick Murchison, namely, that trap rock and other indications of volcanic eruption are no guide to the presence of gold, unless in the neighborhood of Silurian rocks.—*Journ. Frank. Inst. Oct.* 1863, *from Jour. Soc. Arts.*

NOTE ON FORMOSA CAMPHOR.

By Robert Swinhoe, F. G. S. etc., H. M. Consul at Taiwan.

The manufacture of this article has for some years been monopolized by the Taotai (or head Mandarin) of the island, and its sale farmed out to wealthy natives. In former years, a good deal of the drug was clandestinely produced, and smuggled across to China, where it was largely bought up by foreign speculators, and carried to Hongkong for shipment to Calcutta, at which place it finds the readiest market, being used by the natives of Hindostan for lubricating the body and other domestic purposes. But now its monopoly is so closely watched that almost the entire trade in it falls to the lucky individual whose Chinese agents can secure the monopoly. This bad system has

occasioned the price of the article in Hongkong to increase considerably in value, and to make the profits accruing to the fortunate monopolist almost fabulous. The cost of the drug, I learn, amounts to only six dollars at its place of manufacture. The monopolist buys it from the Mandarin at 16 dollars the pecul, and sells it in Hongkong at 28 dollars. The gigantic laurel (*Laurus Camphora*) that yields the camphor, covers the whole line of high mountains extending north and south throughout Formosa. But as the greater part of this range is in the hands of the aborigines, the Chinese are able to gain access only to those parts of the mountains contiguous to their own territories that are possessed by the more docile tribes. The trees, as they are required, are selected for the abundance of their sap, as many are too dry to repay the labor and trouble of the undertaking. A present is then made to the chief of the tribe to gain permission to cut down the selected trees. The best part of the tree is secured for timber, and the refuse cut up into chips. The chips are boiled in iron pots, one inverted on another, and the sublimated vapor is the desired result. The camphor is then conveyed down in carts of rude construction, and stowed in large vats, with escape-holes at the bottom, whence exudes an oil, known as *camphor-oil*, and used by Chinese practitioners for its medicinal properties in rheumatic diseases. Samples of this oil have been sent home, and it may eventually become a desideratum in Europe. From the vats the camphor is stowed in bags to contain about a pecul each, and is thus exported. The Chinese government has empowered the Formosan authorities to claim on its account all the timber produced by the island for ship-building purposes; and it is on this plea the Taotai appropriates the prescriptive right of dealing in camphor. About 6000 peculs of the drug are annually produced in the neighborhood of Tamsuy.—*Pharm. Journ., London, Dec.*, 1863, *Extracted from Paper read before the British Association at Newcastle.*

ORIGIN OF VARIETIES IN PLANTS.

According to the Gardeners' Chronicle, quoting from *Les Mondes*, "M. Decaisne, the very able Professor of Cultivation in the Garden of Plants, Paris, has lately brought under the notice of the Academy of Sciences some very interesting remarks upon the varieties of cultivated plants in general, and of Pears in particular." Decaisne remarks;—"The almost unlimited and ever increasing number of varieties in fruit-trees, vegetables, and all useful plants is a fact to which science has at present given too little attention. . . . These new forms, what are they? Can they be, as has been recently asserted, true species which have remained unknown up to the time when they were first subjected to cultivation; or are they merely modifications of ancient known species, assuming various appearances according to climate or situation? It may appear strange that such a question should be brought before the Academy, so natural does it seem for a species to be subject to change." . .

Botanists in the present day may be divided into two schools. The more ancient, which may be called the Linnæan, admits the changeableness of species; within certain limits, no doubt, though it is not always easy to define them. Hence those large polymorphous species, sometimes vaguely defined, but generally easy to characterize by a short descriptive phrase. The other school, which belongs especially to our own time, and which may be designated as the school of immutability, denies most positively any tendency to variation in the vegetable kingdom. According to it, the forms of species never alter in the slightest degree; and when two plants of the same genus present any palpable difference, however slight it may be, these two plants form two species, radically distinct from the beginning of things. According to M. Jordan, of Lyons, a very eloquent advocate of the modern school, all the races and all the varieties admitted by the ancients become so many species. In his eyes, all our races and all our varieties of fruit-trees, of Pears amongst others, are distinct, unchangeable species, always preserving their own characteristics from generation to generation. Hence it follows that these trees did not proceed, as is commonly believed, from a single or even from a few specific types,

which cultivation has caused to vary, but from as many original types as there are perceptible varieties."

Although the absurdity of the latter view seems evident enough, Decaisne proceeds to refute it, by the record of his observations and experiments. He has raised seedlings from four very different varieties of Pears, and each of the four gave rise to a considerable number of new varieties, as different from each other and from their mother, as she was from the greater part of our old varieties. "It is not only in the fruit that trees raised from the same seed differ; but also in the time of their ripening, general appearance, and in the form of their leaves.

"Some have spines, some have none, some have slender wood, in some it is stout and coarse. Upon some of the seedlings of the old *Poire d' Angleterre* the variation went so far as to produce lobed leaves, like those of the Hawthorn or of *Pyrus Japonica*. Everything varies in the Pear-tree, even to its sap. As proof of this observe the very different success of the graft, according to the stocks employed. All the varieties and races of Pear-trees bear grafting upon a Pear-tree, that is to say, upon the wild Pear-tree; but all will not take upon the Quince, as for example the *Rance*, *Clairgeau*, *Bosc*, *Duchesse de Mars*, &c." The flowers also showed very striking variations. As to size of fruit the transition is said to be perfect from the wild Pear of Blidah, which is only the size of a pea, to the *Belle d' Anguine* and *d'Amour*, which vie with a melon of middling size.

That these extreme forms belong to different species which have crossed and recrossed thousands of times with each other, producing fertile hybrids, &c., Decaisne will not allow to be probable. But it would be difficult to disprove it. He admits the crossing, but maintains that the constant fertility, after every conceivable cross, argues identity and not diversity of species.

"Does the graft, as some people maintain, alter the character of the variety?" He concludes it does not. "The notion that fruit-trees degenerate because they are propagated by grafting is an error which must be exposed. There is no single fact to prove it. Those which have been cited depend upon totally different causes, first and foremost among which are climate, unsuitable soil, and very often bad cultivation or a neglect of pru-

ning, so common now-a-days. Our ancient pears, which a century or two ago were so justly esteemed, are now exactly the same as they ever were; they ripen at the same time and keep good just as long. . . The pretended degeneracy of ancient races is really nothing more than one of the clever devices of the present day."

"On the other hand, can it be true, as Van Mons and many pomologists believe, that the pips of a good fruit produce wild austere fruit, and thence return to what they suppose to be the specific type? I do not hesitate to declare the contrary, and I defy any one to bring forward an example of a good fruit, whose flowers were fertilized by their own pollen, or by that of any of their own race, whose seed has produced wild fruit. . . . It may be considered certain, that all superior varieties of the Pear-tree, and I may say of all fruit-trees, if they are fertilized by themselves, produce good fruit. They may vary, and will probably do so, sometimes in one peculiarity and sometimes in another, according to the variety; but none will become wild, any more than our seedling Cantaloupe melon return to form and flavor of the little wild melons of India, or than our Cabbages and Cauliflowers return to some one of the wild races that grow on the sea-shore. Whatever the advocates of immutability may say, the species of plants are really subject to great variation; and there is much truth in the theory which refers to the same specific type, races and varieties which, though very different in appearance, have the same morphological organization, and which, like the members of the same family, are capable of crossing with one another . . . Take any one of our races of Pear-trees, and transport it to all the regions of the globe; wherever it can exist, it will struggle to adapt itself to the situation, and after a few generations it will have given birth to new and numberless varieties. This fact, which takes place under our own eyes, in the case of every cultivated plant that is much distributed over the world, gives the key to those polymorphous species which perplex botanical classifiers, and which have only become what they are by nature herself having spread them over an immense expanse of country."

We remark, 1, that a view which we have more than once re-

ferred to, *i. e.*, that variation is a result of domestication, and that there are no wild varieties (a view which essentially coincides with that of Jordan, as stated above), is sufficiently refuted by Decaisne's experiments. For one of the four Pears of his experiments, the *Sauger* is a wild variety, or nearly so, and its seedlings were not behind those of the other sorts in amount of variation. And 2, although no varieties may not have yet been shown to *degenerate* while duly cared for, under continued propagation from buds, it does not follow that they would *continue to exist* in perpetuity. It can hardly be otherwise than that the *existence of a species* is prolonged by sexual reproduction as it would not be by budding, or sex lesspropagation.—A. G.

Am. Jour. Sci. and Arts, Nov. 1863.

REMARKS ON LEMON-JUICE AND ITS PRESERVATION.

By Charles Symes.

The fact that prescriptions, ordering alkaline mixtures to be taken effervescing with lemon-juice, are often accompanied by instructions that "the lemon-juice is not to be sent," is both unpleasant and unprofitable. Unpleasant, as indicating suspicion on the part of the prescriber that the dispenser will not faithfully discharge his duty, in sending exactly what is prescribed, and thus weakening the confidence of the patient; unprofitable, as it deprives the pharmaceutist of a portion of his legitimate profit. Now as there can be no effect without a cause, so there must be a reason why the above instructions are so frequently received, and it appears to be just this:—Lemon-juice will not keep for any length of time if simply strained and bottled. Pereira and Royle, after stating this, give formulæ for its *artificial* preparation, and there can be no doubt that a substitute so prepared is largely used. This, in dispensing, is about as justifiable as extemporizing Inf. Cinchonæ by an aqueous solution of quinine and cinchonine. Yet who would countenance the latter? Royle also states that "druggists in this country preserve it (the fresh juice) by adding $\frac{1}{10}$ of spirit of wine, and filtering off the mucilage." Spirit is highly objectionable in cases for which effervescing mixtures are usually prescribed, therefore this also would be inadmisible for dispensing purposes.

Undoubtedly, in some establishmments, lemon-juice is pre-

served in the manner I am about to mention, but it is quite certain that in very many it is not; and they either follow one of the above practices, or make the necessary delay of procuring and pressing lemons, and straining the juice when required.

The process Mr. Alsop recommends, and Dr. Redwood has frequently advocated for the preservation of infusions, applies equally to lemon-juice,—viz.: heating to the boiling-point, and excluding the air by carefully closing the full bottles at this temperature. Thus prepared it keeps well for more than twelve months, but early last winter I made some experiments to ascertain if ebullition were really necessary, and I find it is not; juice heated only to 150° and excluded from the air at that temperature, is now in a perfect state of preservation. I cannot say, however, that this holds good if it be bottled during the summer months; in fact, my experience indicates otherwise.

This might arise from the juice, when expressed, being in an incipient state of change, as it is well known that lemons are very prone to decay at this season, and microscopic organisms being in a more vitally active condition than during the winter, are probably capable of sustaining a high temperature for a short period; and thus, although the heat applied might retard, it does not totally destroy the tendency to decomposition.

If a little care is exercised, stoppers or perforated corks are unnecessary, common corks answer quite well; and for covering the tops of these (when cut off), I think bees'-wax will be found superior to sealing-wax, as it adheres firmly and is not so liable to crack.

I would then suggest, that if a ten or twelve months' stock of lemon-juice is thus bottled at a temperature not necessarily above 150° *during the winter*, the dispenser would be enabled without delay to send it out in a state even superior to that freshly obtained from the fruits; and this being generally adopted would give satisfaction both to prescriber and patient. —*Pharm. Jour., London, Oct.*, 1863.

THE COMPASS PLANT.

By T. Hill.

Riding near Chicago, August 8, 1863, I saw, for the first time, *Silphium laciniatum* growing wild. The field had once

been ploughed and sown with timothy, and there was a grove a few rods to the east. Notwithstanding these unfavorable circumstances, I took a rough measurement of thirty plants, without selection, as follows: Holding a card over each plant with its edge parallel to the central line of my own shadow, I marked upon the card a short line parallel to each leaf of the plant. Measuring afterward the angle which each mark made with the edge of the card, and subtracting from each angle the azimuth of the sun for the estimated central time of observation, I obtained the following results. Only one plant, bearing four old leaves, gave an average angle with the meridian of more than 34°. Their mean was 18° west. The remaining 29 bore 91 leaves; which made with the meridian the following angles,—viz.: Seven made angles greater than 35°; fifteen, angles between 35° and 20°; sixteen, angles between 20° and 8°; twenty-eight, angles between 8° and 1°; and twenty-five, angles less than 1°.

Of the 69 angles less than 20° the mean is N. 33′ E., i. e. about half a degree east of the meridian. The error of azimuth, from my want of means to determine the time accurately, may have been as much as three times this quantity. One half the leaves bear within about half a point of north, two-thirds within a point.

The magnetic declination was about 6° east. The observations were made when the sun was about on the magnetic meridian.—*Am. Jour. Science and Arts, Nov.*, 1863.

PRELIMINARY NOTICES OF A NEW METAL.

By F. Reich and Th. Richter.

The authors have found a new metal in two Freiberg ores, which were composed principally of arsenical pyrites, blende, and some galena, together with silica, manganese, copper, and a small proportion of tin and cadmium. The ores were first roasted to get rid of the greater part of the arsenic and sulphur, then mixed with chlorhydric acid, evaporated to dryness and distilled. The impure chloride of zinc obtained was examined with the spectroscope for thallium. No green line was seen, but the authors remarked an indigo-blue line, which was before unknown.

The authors succeeded in isolating the conjectural substance, necessarily in very minute quantity, partly in the form of chloride, partly as hydrated oxide, and partly in the metallic state. On submitting these, moistened with chlorhydric acid, to the spectroscope, the blue line was seen so brilliant, sharp, and persistent, that they did not hesitate to conclude that it belonged to a hitherto unrecognized metal, to which they accordingly gave the name *Indium*.

The line mentioned has a perceptibly greater refrangibility than the blue line of strontium, and there appears besides a much weaker line, of still greater refrangibility, which almost, but not quite, reaches the blue line of calcium.

The authors add that, as far as they have examined the chemical properties of *Indium*, they may safely assert that it is not precipitated from an acid solution of the chloride by sulphuretted hydrogen; that from the same solution it is precipitated by ammonia as a hydrated oxide; that the chloride is extremely deliquescent; and that the oxide heated on charcoal with soda gives lead-gray metallic beads, which are ductile and very soft; these heated again before the blowpipe give a yellowish coating, which on further heating takes no characteristic color with cobalt solution.—*Chemical News, Sept.* 12, 1863, *from Journal für Praktische Chemie*, lxxxix., 441.

NEW METHOD FOR THE CONCENTRATION OF MINERAL WATERS.

Sea-water, in freezing, forms flakes of ice consisting of nearly pure water, and an extremely saline liquid which in Northern countries is utilized in the production of marine salt. Very recently, Dr. Robinet, a physician of Paris, has discovered that the same process can be applied in the purification of fresh water. In freezing water from the Seine, from wells, and from springs, he found the ice produced to be so entirely free from the salts of lime and magnesia which were contained in the water, that, thus purified, it may be considered as nearly equal to distilled water. So it is now proposed to procure water on board ships, no longer by distillation but by congelation, by

by means of the apparatus of Mr. Carré, of which mention is made below.

The same fact is made use of in the concentration of mineral waters, a problem which has offered itself for a long time, but which the employment of heat could not solve, on account of the gas originally in solution, which the heat expelled. Cold works better. Dr. Ossian Henry, of Paris, has experimented with forty different varieties of water, and finds that it is possible by congelation, to reduce mineral waters to one-eighth, one-tenth, one-fifteenth, or even one-twentieth of their original volume, without producing any alteration in the gases contained in them.

100 litres of mineral water can thus be reduced to 5, giving great economy in transportation; moreover, the ice itself is also valuable. But we do not believe that the therapeutic properties of the extract will be identical with those of the water in its original state, because of the changes which manifestly take place in the contained salts, changes so evident that Mr. Balard has been able to base upon them a manufacture of sulphate of soda, by exposing to a temperature sufficiently low the waters containing NaCl and MgO, SO_3, which result from the manufacture of sea-salt by the evaporation of sea water.

The publication of this process has given occasion for a protest on the part of Mr. Tichon, an apothecary of Aix les Bains (Savoy), according to which the same process has been used since 1856, by him and a Mr. Melsens, who was staying at Aix for his health. The mineral water which he drank here, and which is sulphurous, proving disagreeable to his taste, he undertook to remove part of the odor by submitting it to a freezing mixture. In this way he was able, not only to mask the disagreeable odor, but also to concentrate the mineral ingredients.

Mr. Tichon adds that congelation will not suit all mineral waters, inasmuch as it alters the organic matter therein dissolved.—*Am. Journ. Science and Arts, Nov.*, 1863.

LIQUID PERMANGANATE OF POTASH.

M. Leconte prepares this solution in the following manner: Caustic potash, six drachms; chlorate of potash, five drachms;

binoxide of manganese, five drachms. Dissolve the caustic potash and the chlorate in a small quantity of water, and add the manganese; get rid of the water by evaporation, stirring constantly, and calcine the dry mass to a dark red for an hour in an untinned iron cup; allow to cool, and add a quart of plain water. Then boil for five minutes in a china capsule, and you will obtain a fluid of a slightly purplish tint; decant the solution, and wash the residue with such a quantity of water as to make altogether two quarts. When filtering is thought necessary, the liquid should be passed, not through paper, but through very fine sand. For dressing foul wounds, or for injecting, use one drachm of this solution to from three drachms to five of spring water.—*Am. Jour. Med. Sciences, Oct.*, 1863, from *The Lancet, August* 22, 1863.

ON SOME NEW VOLATILE ALKALOIDS GIVEN OFF DURING PUTREFACTION.

Dr. Crace Calvert communicated under this title to the Royal Society (Feb. 1860) the preliminary results of some investigations on the product of putrid wounds, with reference to the contagion known as hospital gangrene. We have waited the conclusion of his research, but as it has not yet appeared we give the main points of his first paper. Failing to obtain a sufficient supply of the products emanating from putrid wounds, he arranged, in each of a number of small casks, twenty pounds of meat and fish, mixed with pumice stone to prevent clogging. Two tubes were adapted to the top of each cask, one of which supplied air, which was drawn through the other from near the bottom of the cask by an aspirator. The air in its passage passed through two bottles containing chloride of platinum, which was soon made turbid by the production of a yellow amorphous powder. This precipitate collected, washed with water and alcohol, and dried, was found by analysis to contain carbon, hydrogen, and nitrogen, but what was remarkable, sulphur and phosphorus also entered into its composition. The amount of these elements determined quantitatively was 11 per cent. for the sulphur and 6·01 per cent. of phosphorus, of the whole precipitate. By heating a quantity of the platinum salt with a strong

caustic ley, a liquid, volatile and inflammable alkaloid was obtained, whilst sulphur and phosphorus remained combined with the alkali, and were easily detected. The author is satisfied, from twelve months' research, that no sulphuretted or phosphoretted hydrogen was given off, and his researches tend to prove that the noxious vapors given off during putrefaction contain the nitrogen, sulphur, and phosphorus of the animal substance, and that these elements are not liberated in the simple form of ammonia, and sulphuretted and phosphoretted hydrogen. As putrefaction proceeds, different volatile bodies are given off. The platinum salts, heated in test tubes, give off vapors, some acid, some alkaline, of a most noxious and sickening odor, resembling putrefaction, while a white crystalline sublimate is formed, which is not sal-ammoniac. These researches are still in progress, and will occupy several years.—*Am. Journ. Science and Arts, Nov.*, 1863.

ON THE EXTRACTION OF THALLIUM ON A LARGE SCALE FROM THE FLUE DUST OF PYRITES BURNERS.

By W. Crookes, F. R. S.*

All the processes for the extraction of thallium hitherto published by myself and others have been applicable to but small quantities of the material from which the metal is obtained. They have in most cases directed the employment of distilled water and porcelain basins, and have involved the passing of sulphuretted hydrogen through filtrates—a method of proceeding altogether out of the question when large quantities of deposit are to be dealt with. Having for many months past been occupied, in conjunction with Messrs. Hopkin and Williams, manufacturing chemists, of Wandsworth, on the extractum of the metal from an amount of material far greater than has ever been treated before, I propose to bring before the meeting an account of the methods we have ultimately adopted.

I have received from various quarters some hundreds of specimens of deposit, flue dust and minerals, every one of which was first of all carefully tested for thallium by means of the spectroscope. The practical employment of spectrum analysis

* Read before the British Association at Newcastle-upon-Tyne, September 1, 1863.

is, I regret to say, of but very limited use, and has caused me many disappointments before I finally determined to abandon it, except by way of confirmation in subsequent experiments. The spectrum by itself gives no indication of quantity. The green line produced by a residue containing but one part of thallium in a thousand is as vivid and distinct as the line given by the pure metal, and therefore, before I could decide whether a deposit contained sufficient thallium to repay for its extraction, it was necessary to make an estimation in the moist way by exhausting a weighed quantity of the dust with water, and adding hydrochloric acid to the solution. Associated with thallium in these deposits is unfortunately a variety of other metals, which render the separation of the thallium in a pure state a rather difficult matter. Amongst these metals I have found mercury, copper, arsenic, antimony, iron, zinc, cadmium, lime, and selenium, together with ammonia, sulphuric, hydrochloric, and nitric acids.

In a lecture delivered at the Royal Institution of Great Britain on Friday evening, March 27, 1863, I referred to a curious parallelism between the discovery of selenium and that of thallium. The great Swedish chemist, Berzelius, was engaged in the examination of a residue for tellurium, when he found a hitherto unknown metalloid, to which he gave the name of selenium. In my own case a very similar residue was also being examined for tellurium by means of the spectroscope, when I first noticed the green line which led me to the discovery of thallium. Soon after the publication of that lecture, Dr. Alfred Swaine Taylor was kind enough to send me a powder which is beyond doubt a portion of the identical residue in which Berzelius found selenium. The original specimen is preserved in the laboratory of Guy's Hospital, in a bottle labelled as follows:—

"Mixture containing selenium from the Gripsholm Works in Sweden. Sent by Professor Berzelius to William Allen in 1820."

William Allen was formerly lecturer on chemistry in Guy's Hospital. The powder was given to Dr. Taylor by Mr. Daniel Hanbury some years since. The authenticity of the specimen is thus placed beyond a doubt. It is of especial interest to be enabled to decide positively whether thallium was present or absent in the mixture in which Berzelius discovered selenium. This I am now able to do. I have examined the specimen sent

by Mr. Taylor with the most scrupulous care in the spectroscope, but have been unable to see the faintest trace of the green line. Had thallium been present it would scarcely have escaped the keen observation of Berzelius—that most acute and persevering of modern chemists.

Amongst those manufacturing firms to whom I am indebted for flue dust, my thanks are especially due to the Walker Alkali Company and Messrs. Allhusen and Sons, of this town, Mr. Spence and Messrs. Roberts, Dale, and Company, of Manchester, Messrs. Chance Brothers, and Adkins and Company, of Birmingham, the Metropolitan Alum Company, of Bow, and Messrs. Wilson and Son, Glasgow. From each of these firms I have received every assistance which I could desire, in specimens from different parts of the flues, and their entire stock of thalliferous flue dust, varying in quantity from one or two up to thirty cwts. Were I to mention those who have kindly forwarded me specimens—unfortunately containing no thallium—I should have to give a catalogue of half the chemical works in the kingdom. My thanks are particularly due to J. Lowthian Bell, Esq., Mayor of Newcastle, for the handsome present of an ingot of thallium, weighing half a pound, prepared at his aluminium works at Washington.

The flue dust upon which we have as yet operated amounts to about five tons, the whole of which has been treated by the method I am about to describe. Some of the gentlemen I see around me who are in the daily habit of dealing with much larger quantities of materials, may perhaps smile at the mention of difficulties of manipulating such an amount, and yet even in the well-appointed laboratory of Messrs. Hopkin and Williams, and with the valuable personal superintendence of these gentlemen, the difficulties have been very serious. In the first place, the whole of the material had to be boiled in water and then filtered. As a matter of course the filtrate is extremely acid, and notwithstanding the most careful watching, the filters would occasionally break, and a considerable loss of material ensue. Then again, when the liquor is left to deposit, so that the thallium solution may be decanted, the residue occasionally sets into a hard compact mass, which expands in cooling, and splits the vessel in which it is placed. In this way we had the misfortune to lose many pounds of metal; three twenty-gallon pans have been

broken in one night. Further, the choice of a vessel in which the material could be boiled was a matter of some difficulty. Enamelled iron vessels, which seemed to offer the best means, were found to be very objectionable. The acid solution rapidly destroyed the enamel, and the thallium was then precipitated upon the exposed iron. These are a few of the difficulties which we had to encounter in the early stages of the proceedings; but they have happily been surmounted, and the process I am about to detail is one by which any manufacturer, bearing in mind the facts I have just stated, may set about the extraction of thallium on as large a scale as he may deem desirable.

The process which is at present adopted at Messrs. Hopkin and Williams's laboratory is as follows:—The thalliferous dust is first treated in wooden tubs with an equal weight of boiling water, and is well stirred; during this operation a considerable quantity of nitrous acid is evolved; after which the mixture is allowed to rest for twenty-four hours for the undissolved residue to deposit. The liquid is then syphoned off, the residue is washed, and afterwards treated with a fresh quantity of boiling water. The collected liquors, which have been syphoned off from the deposit, are allowed to cool, precipitated by the addition of a considerable excess of strong hydrochloric acid, and the precipitate, consisting of very impure chloride of thallium, is allowed to subside. The chloride obtained in this way is then well washed on a calico filter, and afterwards squeezed dry. I may mention that from three tons of the dust I obtained 68 pounds of this rough chloride.

The next step in the process with this large quantity is necessarily a tedious one. It consists in treating the crude chloride in a platinum dish with an equal weight of strong sulphuric acid, and afterwards heating the mixture to expel the whole of the hydrochloric acid. To make sure of this, the heat must be continued until the greater part of the excess of sulphuric acid is volatilised. After this the mass of sulphate of thallium is dissolved in about twenty times its weight of water, and the solution filtered. On the addition of hydrochloric acid to this solution, nearly pure chloride of thallium is thrown down; this is collected on a calico filter, well washed, and then squeezed dry.

The object of the process so far has been to obtain a tolerably pure chloride; but as thallium is most easily reduced to the me-

tallic state from the sulphate, it is now necessary to again convert the chloride into sulphate. For this purpose we add the dry chloride gradually to hot sulphuric acid, using four parts by weight of strong acid to six parts of the chloride. The mixture so obtained is heated strongly until all the hydrochloric acid is expelled, and the residue assumes the form of a dense liquid. This, being set aside, solidifies on cooling to white crystalline mass. When this is dissolved in water an immense amount of heat is evolved, and great care must be taken to avoid breakage of the vessels. The best way of dissolving it is to add it slowly to ten times its weight of hot water. A solution is thus obtained, which must be filtered, and on being concentrated and set aside to cool, crystals of sulphate of thallium will be obtained, which may be rendered quite pure by re-crystallisation, a little hydrosulphuric acid being previously added, if necessary, to separate arsenic, mercury, &c.

The final step in the process is the reduction of the metal from this sulphate. Many ways can be adopted for the reduction when only a few ounces are under experiment; but when the quantity of crystallised salt is from a quarter to half a hundredweight, a process must be devised which will admit of considerable quantities being reduced without too much expenditure of time or trouble. Experiments in the dry way were not very successful. No difficulty was experienced in partially reducing the metal by igniting the sulphate with black flux, or with cyanide of potassium, in a clay crucible; but I could not remove all the sulphur in this way. When sulphate of thallium is projected into a crucible containing fused cyanide of potassium there is an immediate reduction to the state of protosulphide, which forms a brittle, metallic-looking mass, of the lustre of plumbago, and fusing more readily than the metal.

A few cells of Groves' batteries offer a most ready means of reducing the sulphate, and in quantities less than half a pound nothing can be simplier than the electrolytic process.

For reducing the metal in quantity I found no plan so good as its precipitation with metallic zinc. Plates of pure zinc (which must leave no residue whatever when dissolved in sulphuric acid) are arranged vertically round the sides of a deep porcelain dish holding a gallon. About seven pounds of crystallised sulphate

of thallium are then placed in the dish, and water poured over to cover the salt. Heat is applied, and in the course of a few hours the whole of the thallium will be reduced to the state of a metallic sponge, which readily separates from the plates of zinc on the slightest agitation. The liquid is poured off, the zincs removed, and the spongy thallium washed two or three times. It is then strongly compressed between the fingers, and preserved under water until it is ready for fusion. The fusion of the metal is readily effected. An iron crucible is placed over a gas-burner, and a tube is arranged so that a constant stream of coal gas may flow into the upper part of the crucible. Lumps of the compressed sponge are then introduced, one after the other as they melt, until the crucible is full of metal. It is then stirred up with an iron rod, and the thallium may either be poured into water and obtained in a granlated form, or cast into an ingot. Thirty or forty fusions have been performed in the same crucible without the iron being acted upon in the least by the melted thallium. The products of these fusions were ultimately melted together and cast in an iron mould. The result is the accompanying bar of thallium, weighing a quarter of a hundredweight.

Thallium contracts strongly on cooling. The coating of tarnish which it acquires while hot is instantly removed by water, which renders the surface perfectly bright. The liquid metal in the crucible, when protected by the stream of coal gas, can scarcely be distinguished from mercury. Thallium is not absolutely identical in color with any other metal, but approaches nearest to cadmium and tin. It has perfect metallic lustre. Its specific gravity is 11·9. It is very malleable, but not very ductile. It can only be drawn into wire with great difficulty, but by the operation technically known as squirting, thallium wire may be formed most readily. Thallium is very soft, being only exceeded in this property by the alkali metals. A point of lead will scratch thallium with the greatest readiness. Thallium possesses the property, in common with soft metals, of welding by pressure in the cold. Rubbed on paper, it gives a dark streak, having a yellow reflection, which in a short time nearly fades out, but may be restored with an alkaline sulphide. Thallium is strongly diamagnetic, being in this respect nearly, if not quite, equal to bismuth. It melts at 550° F., and distils at a red

heat, evolving brown vapors into the air at a temperature little above its melting point. When a minute fragment of thallium, or of any of its salts, is introduced into the flame of a spirit lamp, it colors it of a most intense green, which, when examined by means of a spectrum apparatus, appears to be absolutely monochromatic, communicating one single green line to the spectrum. This property of the metal is now too well known to require further remarks; from it the name thallium was chosen.

A magnificent green fire for pyrotechnic purposes can be made with— Chlorate of thallium 8 parts,
Calomel 2 parts,
Resin 1 part.

The chlorate of thallium is a beautiful crystalline, difficultly soluble salt, which may be prepared by dissolving the metal in chloric acid, or by mixing together saturated aqueous solutions of chlorate of potash and nitrate of thallium. It is anhydrous.

At the present price of thallium, its employment for pyrotechnic purposes would be out of the question; but a very little reduction in price would enable its magnificent green flame to be advantageously employed for ship signals, as the extraordinary intensity and monochromatic character of the light would enable it to penetrate a hazy atmosphere without the change of color suffered by the ordinary green lights in which baryta is used. The atomic weight of thallium is 203. This result, however, is not deduced from sufficiently accurate analyses to render it entirely trustworthy, and I am now engaged in determining the equivalent in a more accurate manner. The physiological action of thallium is a matter of some doubt. I cannot say that it has produced any particular effects upon me, although I have been much exposed to the action of its fumes during the last few months, and have occasionally swallowed a grain or two of its salts. The only effect which I have noticed, besides the staining of the hair and nails, is a corrosive action which the sulphate has on the skin, burning the hands and rendering the epidermis yellow and horny. In this respect it acts like mercury salts.

Several thallium salts are sensitive to light. The protochloride and double phosphate of thallium and ammonia are especially so.—*Chem. News, London, Oct. 3d*, 1863.

SCHEELE AND HIS DISCOVERIES.

(Translated and arranged from the Memoir of M. Cap.)

By Mr. Joseph Ince.

Certainly not in this Journal should the life and labours of Scheele be unnoticed. His career is a bright example of how far the mind may triumph over external difficulties, and of how little value are adventitious aids when genius is linked with perseverance. To us especially as Pharmaceutists must the record be of interest, teaching, as it does, that nothing is denied to patient industry, and that the loftiest results have been, and therefore may be again within the grasp of the man who has to earn his bread by the humblest plodding behind a Druggist's counter.

Charles William Scheele was born at Stralsund, December 9th, 1742. Stralsund is a town in Swedish Pomerania, and now belongs to Prussia. He was the son of a small tradesman, burdened with a numerous family. His father placed him with a M. Bauch, an old family friend, an apothecary at Gottenburg. Apprenticeship in Sweden lasted generally six years, at the expiration of which the apprentice took the title of "garçon," and later on, that of assistant (*aide-apothicaire*). Scheele's classical studies had been painfully limited, and his first essays in Pharmacy were more painstaking than successful. He was a laborious reader of works relating to his profession, especially those of Neumann, De Lemery, De Stahl, and one of Kunckel's, called "The Laboratory"; and he often worked out at night experiments that the day's study had suggested. One word will best describe him—diligent. After some years' stay with M. Bauch he went to Malmöe, in Scania, where he spent five years with another pharmacien, M. Kaelstroem. There, in silence and retirement, he devoted himself to the deep and serious study of Chemistry. In 1767 he went to Stockholm, became assistant to M. Scharenburg, superintendent of Pharmacy, and stopped there three years; after which he went to Upsal, where Bergmann was a celebrated professor. So great was Scheele's timidity that he had not the courage to present himself before the noted lecturer, though, with the zeal of a true chemist, he had set his heart upon the introduction. Circumstances, however, and the fame of some personal dexterity stood his friend; the student and the *savant* met, were mutually delighted with each other,

and became sworn associates from that hour. A few months afterwards Scheele read a notice on Fluor Spar before the Academie des Sciences, and on the proposition of Bergmann, a simple student of Pharmacy, was elected an associate of the Academy. Such a distinction affected little the studious and retiring Scheele, who longed only for the quiet which would enable him in peace to pursue his studies. In vain Bergmann tried to keep so promising a man at Upsal by the temptation of a good position. In the name of the Government he offered him a Chair in the Faculty, and the direction of different manufactories. Scheele absolutely refused; but learning that there was a vacant pharmacy in a small and obscure country town, he set off for Kœping, on the Lake Malaren. He was then thirty-one years old, and while occupied in the routine duties of that seemingly unenviable position, he pondered over, and in his leisure moments successfully worked out, that series of discoveries that will forever be associated with his name. Two years from this date, (1777), the Royal College of Medicine received him gratuitously, and dispensed with all the usual formalities of introduction. Nine years he patiently worked on at Kœping. He found the business in a languishing condition, and he succeeded in its restoration; paid the debts of his defunct predecessor, as well as created a small fortune for the widow, whom, in his less abstract moments, he meant to marry. Bergmann was his unfailing herald in the world of Science. At his suggestion the Academies of Berlin, Erfurt, and Sardinia, and the Royal Society of Medicine at Paris admitted him amongst their ranks. Just when the present seemed to give promise of the brightest future, he was suddenly enfeebled in his health. He had wished, as a last point of honor, to have left his name and moderate savings to the widow, but the very day appointed for his marriage he was seized with fever, which proving fatal, he died at the early age of forty-three.

The first essay of Scheele was on Tartaric Acid. It was addressed to Bergmann, who returned it to the author without the slightest comment. Hurt by this strange indifference, Scheele sent his manuscript to Retzius, Professor at Lund, who inserted it in the *Transactions* of Stockholm for 1770, but with no acknowledgment of the author. In 1771 he published his "Ex-

amination of Fluor Spar and its Acid." Some years previous, Margraff was engaged on the same subject, and pointed out that Fluor Spar did not contain Sulphuric Acid. Scheele, on treating it with this powerful reagent, noticed certain white acid vapors which attacked the glass. He named this product Fluosilicic Acid. Remarking that the vessel filled with water in which it was collected was covered with a coating of Silica, he at first thought that Silica was composed of Water and Fluoric Acid; but in a second notice (1780) he recognized his mistake, and demonstrated that the Silica obtained came from the glass of the retort or else from the receiver. The ultimate result of this investigation was the admission of the radical called Fluor. In 1774 Scheele published his "Researches on Black Magnesia," otherwise called Manganese. He was then living at Upsal, for it was at the instigation of Bergmann that he undertook this inquiry—one of his best performances. This memoir contains no less than four discoveries, which would have sufficed to have established the reputation of a skilful chemist. In the first place, he discovered that this ore combined eagerly with metallic oxides and with some acids, whence he concluded that black Magnesia had a metallic base. On treating it successively with all the strong acids, he remarked (1) That with Sulphuric Acid he obtained a white pinkish salt (Sulphate of Manganese), and that there was liberated an elastic fluid which was not fixed air, the only gas then known, but which possessed the properties of *dephlogisticated* air, being evidently oxygen. (2) With Muriatic Acid he produced a gas of yellow color, having an odor of Aqua Regia. Having collected this gas in a bladder, it was colored yellow, from which he at first thought that it was Aqua Regia in a state of vapor. He then collected it in bottles filled with water, with Hale's apparatus, and he noticed that the gas corroded the corks and turned them yellow; that it bleached blue Litmus Paper as well as vegetable colors, and that during this action, in presence of water, the gas was converted into Muriatic Acid. He also established that plants once thus bleached did not recover their natural colors, neither on the addition of Acids or Alkalis; that this gas attacked all metals. In a word, he gave an exact and complete history of this new gas, which at first he called *Dephlogisticated Muriatic Acid*,

which since has been termed *Oxygenated Muriatic Acid Gas*, and to which has been recently given the appellation of Chlorine.

A third discovery made by Scheele in studying Manganese was Baryta, with which it is nearly always associated. He showed that this new Earth, which he called *Terre pesante* (βαρὺς, heavy), is distinct from Lime and Silica; that it neutralizes acids, and forms with Sulphuric Acid and the Sulphates a neutral salt insoluble in water. Fused with Borax it forms a vitreous mass, which is colored brown on the addition of a little Sulphur, etc.

Lastly, he remarked that Ammonia, treated by Nitrate of Manganese, is decomposed, producing a gas differing from Carbonic Acid, namely, Nitrogen. Considering that this dissertation on Manganese was published in 1774, and that the experiments on which it is based went back for several years, Scheele may be regarded as having been the first to discover Nitrogen gas, which he for a long time called Vitiated or foul air (*Air vicié ou corrompu*).

Next year (1775) Scheele read before the Academy of Stockholm his *Remarks on the Salt of Benzoin*. Up to this time Flowers of Benzoin, already recognized as an acid, were obtained by means of sublimation. Scheele used the wet way, which gave a better and more abundant product. After boiling powdered Benzoin with quicklime, he filtered the solution and added Muriatic Acid. Benzoic Acid was precipitated in beautiful crystalline plates, of a strong odor when exposed to heat. This ingenious and convenient process has been followed ever since. [A most successful though unfortunately secret process was adopted by Mr. Fowler, of Bedford Street, Covent Garden. Since his death his method has apparently been lost. No Flowers of Benzoin with which I am acquainted are free from a certain empyreumatic odor, varying in different commercial samples, but always present.—J. I.]

The same year Scheele published one of his most important discoveries,—a paper on Arsenic Acid. He imagined that White Arsenic (*the Arsenious Acid* of Fourcroy) could take two degrees of acidity. He treated crude arsenic with Nitrous Acid, and obtained Arsenic Acid; he examined all its combinations with the alkalis and metals; he demonstrated that combustible

bodies could bring it back to the state of White Arsenic, and even of Metallic Arsenic. On heating it in combination with Ammonia, he obtained a gas which extinguished flame, being neither fixed air nor Carbonic Acid. This was Nitrogen. Lavoisier and Berthollet repeated his experiments, and easily explained the various phenomena described by the principles of the new theory of Chemistry. Never weary of his labors, Scheele worked on Quartz, Silica, Clay, and Alum; then he commenced his Analysis of Benzoar, in which he discovered a particular acid, first called Lithic, and afterwards Uric Acid.

These researches paved the way for all the recent investigations of Urinary Calculi, and even of Urine itself.

The same year Scheele obtained Oxalic Acid by the action of Nitric Acid on Sugar. In 1777 appeared his treatise on Air and Fire, a work on which he had been long engaged. Whether or not he may claim to have been one of the original discoverers of Oxygen is uncertain, yet in this identical pamphlet occurs the capital experiment that when Manganese is exposed to a high degree of temperature and then heated with Sulphuric Acid, an elastic fluid is disengaged, which he named Air of Fire. Priestly had in truth announced the same fact in 1774, and Scheele, unfortunately for himself, only published his discovery when his work, which had been seven years in preparation, was complete. He established also the point that common air is composed of Air, of Fire and Foul Air (Nitrogen); that the process of combustion deprives common air of its purest part (Oxygen). The same work contains remarks of the greatest interest on Nitrous Gas, on Sulphuretted Hydrogen, on Fulminating Gold, and on the Radiation of Heat.

In the course of 1778 this wonderfully industrious man published four separate memoirs;—1. A process for preparing Calomel. 2. The preparation of the Oxychloride of Antimony. 3. The preparation of what is still called Scheele's Green, which was obtained on pouring a solution of Potash and white Arsenic in a solution of Sulphate of Copper. It is an Arsenite of Copper. 4. Molybdenum, whose ore was originally confounded with Plumbago; Scheele proved that it was a compound of Sulphur and a whitish powder (Molybdic Acid), from which more recently Hielm extracted Molybdenum in a state of Metal. In 1779 he

continued the same subject, and showed in what manner Plumbago differed from Molybdic Acid, demonstrating that it was composed of fixed air and Carburet of Iron. This analysis was followed by *Experiments on the quantity of pure air contained in the atmosphere.* For a year he continued his observations and obtained the same results as Lavoisier, namely, that pure air (Oxygen) formed $\frac{9}{32}$d part of our atmosphere. About the same time appeared his "Experiments on the Decomposition of Neutral Salts by Quick Lime and Iron."

In the Annals of the Academy of Stockholm, are three published Memoirs belonging to 1780. A. Remarks on Fluor Spar, being chiefly an answer to objections to his previous paper. B. Examination of Milk and its Acid. After having stated the influence of Alkalis and Acids in determining its coagulation, he pointed out that caseine, when calcined, contained Phosphoric Acid and Lime. In order to obtain the Acid of Milk, he evaporated the Serum down to an eighth part, saturated it with quicklime, which he afterwards separated by Oxalic Acid; then he treated the Liquor with Alcohol, which dissolved the Lactic Acid without touching the Sugar of Milk. On distilling the Alcohol he obtained pure Lactic Acid. C. The examination of Sugar of Milk. On treating the concentrated Serum with Nitric Acid he obtained Saccho-lactic Acid in crystals, or in the form of a white powder, sparingly soluble in water, and forming, with alkalis, crystallizable salts. Each succeeding year is the record of some new and original observation; but we must not linger too long over details.

In 1781 appeared the Memoir on Tungsten and his discovery of Tungstic Acid. In 1782 three new memoirs saw the light, the first being *Observations on Ether*, and the second, *A Method for Preserving Vinegar*; the third, same date, is an *Essay on the Coloring Matter of Prussian Blue.* This is one of his most important dissertations, and probably his *chef d' œuvre.* It is divided into two parts. In the first, Scheele endeavors to discover the substance which, in Prussian Blue, is united with Iron and an alkali. The methods employed in this research are most ingenious, and show the utmost skill in the employment of reagents. By dint of repeated trial, he succeeded in discovering the coloring matter; his first description of it being that it pos-

sessed a peculiar odor, that of bitter almonds; that it had a burning taste, and produced coughing. It is strange that he did not at the same time remark its poisonous qualities. Possibly his very manipulations tended to shorten his life. In order to assure himself of its composition, he treated it successively with all the known alkalis and acids. When found he called it simply *The Coloring Matter.* Bergmann gave it the more ambitious title of *Acidum cærulei Berolinensis,* afterwards styled Prussic Acid by Guyton de Morveau, and finally Hydrocyanic Acid by Gay Lussac. These experiments were subsequently followed up, Scheele continuing to study the action of this coloring matter on alkalis, acids, and metals.

He established that Prussiate of Ammonia might be entirely sublimed; that that of lime yielded its base to caustic alkalies and acids; that the coloring matter was capable of distillation. This product was used as a test for the presence of iron, and he then designated it as Precipant Liquor. In attempting the elementary analysis of Prussic Acid he at first supposed that it was formed of Ammonia and Oil. To convince himself of this, he tried every possible mixture of Ammonia and fatty bodies, but as no resulting product gave Prussian Blue with Sulphate of Iron, he was convinced that there was no oil in its composition. He put in a crucible carbon and potash, and kept them at a red-heat, then added Sal Ammoniac, and continued the heat until no more ammoniacal vapors were disengaged. He poured the whole into filtered water, and obtained a salt (Prussiate of Potash) which gave a dark-blue precipitate with Sulphate of Iron. By further experiments he came to the conclusion that this *coloring matter* was composed of Ammonia, Inflammable Air, and of a carbonaceous substance. These three bodies—Nitrogen, Hydrogen, and Carbon, are in fact the bases of Prussic Acid. The Annales de Chimie de Crell (1784) contain five memoirs, one being specially interesting to ourselves as Pharmaceutists—the discovery of a Sweet Principle obtained from Expressed Oils and Animal Fats. He obtained it by boiling one part of powdered Litharge in two parts of fat with a little water. This is the ordinary method for making Emplastrum Simplex. The supernatant liquor, separated by decantation, was evaporated to the consistence of a syrup. This substance, of a sweet

taste, much like oil to the touch, was nevertheless not a fatty body, beeause it is soluble both in water and in Spirit of Wine. Exposed to a high temperature it burns, and is distilled at the same degree of heat as Sulphuric Acid. This product is not crystallizable, and does not undergo fermentation. It is needless to state that this was Glycerine, the name having been created for it by M. Chevreul. Since its discovery it has become most extensively applied in Pharmacy, though, like Chloroform, it remained for some time as a chemical curiosity.

The last research that we must notice was an attempt to obtain Citric Acid. Scheele had often been foiled in his endeavors to present it in a pure and crystallizable state. He imagined that the cause of his failure was the presence of a viscous matter in expressed lemon-juice which enveloped it. He tried at first to coagulate this matter by means of Spirit of Wine, but not being successful in obtaining crystals, he imagined that the Acid was masked by some foreign body, which he attempted to separate by mixing concentrated lemon-juice with Chalk. The filtered and washed precipitate was treated with Sulphuric Acid diluted with ten parts of water. The whole was boiled for some minutes, filtered, and concentrated; on cooling, a crop of beautiful crystals was obtained. Some of his last researches were on Acetic Ether, Benzoic Acid and on the Preparation of Prussiate of Potash. *Some* is the only fitting term, for his life was labor, and it is doubtful whether any one man ever crowded more into so short a life. Let it be remembered, to his honor, that he was simply a working Pharmaceutist, and that he passed nearly his whole life behind a druggist's counter. We must recollect, says M. Cap, that Scheele was not a professional Chemist, a *savant* whose sole mission was the advance of science, being able to give his whole time and abilities to that end. So far from it, the moments consecrated to study were never allowed to interfere with the routine of his occupation. In the midst of the dry and necessary duties of daily life, he had to ponder his experiments and to construct his simple apparatus. His fortune was too slender to let him wander into elaborate experiment, added to which, the character of his mind forbade any but the plainest and most direct methods of investigation. He seems to have thought intently, and then to have manipulated, for which

reason the intermediate steps of his reasoning are seldom given in his writings. Nothing could be more bare and unpromising than his apparatus: a common furnace, a still, a sand-bath, a crucible, sundry phials, drinking-glasses, and bladders to receive his gases, constituted the whole wealth of his laboratory. With these simple elements he recognized acids, gases, metals, and elementary bodies, and worked at transcendental Chemistry in a back shop, with a few bottles and a retort.

Scheele, to his own great personal hindrance, had never received a single lesson or followed an academical course, and being also little familiar with any other language than his own—the German—he often was laboriously engaged in preliminary details which a knowledge of contemporary literature would have spared him, and he not unfrequently repeated experiments that had already been successfully attempted. He was thus forced to be profoundly original.

M. Dumas, no mean authority, declares:—"Whenever it is a question of facts, Scheele is infallible. Scheele rose to the highest rank he could attain by work, experience, and thought, without the aid of any scientific education. Whether he could have risen higher, I know not; still, when it is commonly said that in order to work for the advance of Science, it is necessary to live in the grand University centres and not in the atmosphere of provincial life, we cannot help turning our thoughts on Scheele and Kœping." Still, it must be allowed, that Pharmacy came somewhat to his aid. Had he not been a pharmaceutist his mind would not naturally have been led to the consideration of many subjects that came prominently under his notice. Thus, Cream of Tartar suggested his first essay on Tartaric Acid, and no sooner had he devised a method by which he could isolate this principle, than he applied it to the investigation of a great number of other acids and principles analogous. Once on the right track of analysis, he studied Benzoin, Gall-nut, Rhubarb, Orris, Asclepias, Turmeric, Ether, Milk, the fatty bodies, Salt of Sorrel, the Salts of Mercury, and many objects of Materia Medica. Indeed, he was led to his various discoveries by the exigencies of his daily life; his Pharmacy was the guide to his abstract Science.

The personal history of this great experimenter is almost

whimsical in its simplicity, even when taking into consideration the plain and unostentatious living of the North. Scheele had but one passion—Science; for that he lived, and for that he had originally withdrawn himself from the stir and emoluments of city-life, that in its service he might die. It is almost impossible to match his marvellous devotion to one object, and the sincerity with which he despised wealth and honors. The King of Prussia in vain tried to have him at Berlin. The English Government offered him a post of distinction and £300 a year, both of which he refused. As we might expect, he was of a serious disposition, and spoke little. Never in a hurry, yet he was never idle, and he invariably pursued one study at a time.

In 1782 the President of Virly and M. d'Elluyart, a Spanish chemist, went on a pilgrimage to make the personal acquaintance of Bergmann and Scheele. After having seen Bergmann at Upsal, and from him obtained an introductory letter for Scheele, they went to Kœping, found the humble and learned apothecary in his shop, adorned with the traditional white apron (*revêtu du tablier traditionnel*), and busied with his ordinary work. Scheele received them most cordially, but kept at his business, and offered no excuse. He talked with them on the recent progress of Science, of his own researches, and of the discoveries of Bergmann. "He is the honor of Sweden," said Scheele to the two friends, who quite thought that he himself might share the compliment. The travellers invited him to dinner, but no sooner was it ended than he rose, went back to his laboratory, and let them follow at their leisure.

One last anecdote must not be omitted. The King of Sweden, Gustavus III., being on a tour in Italy, was present at a meeting of the Academy at Turin, of which Scheele had been elected a foreign member. Much was said of the important discoveries of the Swedish chemist, and some one asked the King (who piqued himself on knowing all the eminent men in his kingdom) how the illustrious Scheele was. "He is very well," replied the King, who, until that moment, had never heard his name. On his return to Sweden he hastened to gain information of this man, whose fame had penetrated Europe, and who was unknown in his own country. He learnt that the great chemist was a simple apoth-

ecary in the little town of Kœping. The King wished to ennoble him; the honor was refused; the order of knighthood was nevertheless transmitted; but being addressed to a namesake, Scheele remained with no other title than that of one of the greatest chemists of Sweden, and of his age.—*Lond. Pharm. Jour., Nov.*, 1863.

ON THE PREPARATION OF ACONITINE.

By MM. Liégeois and Hottot.

The process for preparing the valuable alkaloid aconitine, given by the authors above named, is, we believe, of English origin, and will, with a slight difference, be incorporated in the forthcoming British Pharmacopœia; we therefore extract it:—

"The bruised root of the *Aconitum napellus* is digested for eight days in alcohol slightly acidulated with sulphuric acid. The alcoholic solution is then pressed out, and the alcohol distilled off. A small quantity of green oil and an aqueous extract are thus obtained. The green oil is separated, and the extract further evaporated to the consistence of a syrup. It is now dissolved in water and neutralised with magnesia, and then shaken up with ether. The ethereal solution on evaporation yields the rough aconitine. This is again dissolved in water acidulated with sulphuric acid, and decolorised by means of animal charcoal. Ammonia is then added to precipitate the aconitine, and the mixture boiled, after which the alkaloid is collected on a filter and dried. This part of the process is repeated once, or twice if necessary, in order to obtain the alkaloid with as little color as possible. It is eventually precipitated with a very slight excess of ammonia, and dried at a low temperature."

Aconitine so obtained is of course completely soluble in ether, and possesses remarkable activity. The alkaloid received from the Continent, and commonly sold in England, is, as was recently shown by a correspondent of this Journal, of very inferior quality. Our correspondent administered three grains to a dog without producing the smallest discomfort to the animal. Two milligrammes, or little more than three hundredths of a

grain, prepared by MM. Liégeois and Hottot by the above process, killed a frog in four minutes, while it required a grain and a-half of the most active they could find in commerce to produce the same effect.

What foreign aconitine is we have no means of knowing. It may be, as M. Barreswill supposes (*Répertoire de Chimie Appliquée*, September, 1863, p. 353), "some peculiar principle, such as asparagine, or perhaps, in some instances, for the most part, sulphate of lime." The latter was not the case with two samples we have examined, which possessed no more activity than that mentioned by our correspondent.

The British Pharmacopœia, we have been informed, makes considerable use of alkaloids, and as, in consequence of their greater cheapness, most of these will be imported from abroad, it will be incumbent on pharmaceutists to test their activity by experiments on living animals, or procure the alkaloids from reliable English sources.—*Chem. News, London*, Oct. 24, 1863, from *Journ. de Pharmacie*, August, 1863.

ON THE ESTIMATION OF CREAM OF TARTAR, TARTARIC ACID, AND POTASH CONTAINED IN WINE.

By MM. Berthelot & A. De Fleurieu.

1. In studying the acids contained in wines we have commenced with tartaric acid, being the most known among them. We first tried to find a process for estimating cream of tartar. After various attempts, we decided on the following process:—

Take ten cubic centimetres of wine, which introduce into a small flask, and add fifty cubic centimetres of a mixture of equal parts of alcohol and ether; shake and cork the flask, and leave it for twenty-four hours to the ordinary temperature. At the end of this time the cream of tartar will be precipitated, and will adhere to the sides of the vessels, while the acids, the water, and the rest of the matters contained in the wine remain in solution in the ethero-alcoholic mixture. This mixture retains besides about two milligrammes of cream of tartar, which must be taken into the account.

To effect the estimation, decant the liquid and throw it on a small filter; wash the precipitate, by decantation, in the same

matrass with a little of the ethero-alcoholic mixture, which is thrown on the same filter. Place this filter on the matrass, break it, wash with water, put the filter in the matrass, heat it, and immediately afterwards determine the acid standard by means of normal baryta liquid.

We have arrived at this method by experiments made on an aqueous solution of cream of tartar, to which was added beforehand 10 per cent. of alcohol. Left for several days, we obtained a liquid similar to the majority of wines; it contained three grammes of cream of tartar per litre. The baryta liquid was so adjusted that ten cubic centimetres of the above solution should require about fifty divisions of baryta. This process has been likewise verified for liquids containing either an excess of tartaric acid or small quantities of other organic acids. It is sufficiently correct, even in presence of a considerable proportion of foreign organic acids. Only in presence of a very large excess of these acids does this method fail. We will indicate further on, in treating of the estimation of potash, the means by which this exceptional excess can be ascertained.

II. By applying this process to the study of various wines, we found that—

1. In some wines the quantity of cream of tartar contained in solution was precisely the same as in the saturated solution of cream of tartar containing the same proportions of water and alcohol as the wine. This fact was ascertained especially with regard to the following wines, of which the total acid standard was about six times that of the cream of tartar; Formichon, 1860 and 1862, (3 grammes per litre). This test is so much the more valuable, that these two wines contain no free tartaric acid, though they contain other free organic acids.

2. In most instances the proportion of cream of tartar is less than that of a saturated liquid. The difference amounts to one-half in the Formichon of 1860, in the Médoc of 1858, and ordinary Montpellier. The Savigny of 1859 and the Saint-Emilion of 1857 contain only about a-third of the cream of tartar necessary to saturate them. The smallest quantity was found in the Savigny wine of 1861, which had been frozen (less than a gramme per litre), and in Sautenay wine, 1858,

which had begun to change, and had undergone several changes (half a gramme per litre).

In no case was the proportion of cream of tartar greater than that corresponding to a saturated liquid.

Between the acidity of a wine and the amount of cream of tartar it contains there is no relation. In fact, in two wines of the same acid and alcoholic standards, such as Formichons of 1859—62, the cream of tartar varied from simple to double. The largest amount corresponds to a saturated solution of cream of tartar and to the newest wine. This fact is essential, for it shows that the variations do not seem due to a decomposing action exercised on the cream of tartar by the free acids contained in the wines examined.

We must add that Formichon of 1857, one portion bottled and another portion kept in a balloon—sealed, after inducing a vacuum, for the last three years—contained in each case exactly the same quantity of cream of tartar.

III. Supposing that the above method was applicable to the approximative estimation of the total amount of tartaric acid, and even of the whole quantity of potash contained in wines, we made the following experiments:—

1. Divide a weak solution of tartaric acid into two equal portions, neutralise one of the portions exactly by potash, and mix the two liquids. Add some of the ethero-alcoholic mixture before described, which will precipitate all the tartaric acid in the form of cream of tartar (except the trace of soluble cream of tartar in the mixture). Small quantities of organic acids may be added to the liquid without materially affecting the results.

2. According to these facts it suffices, to decide whether a wine contains free tartaric acid independently of cream of tartar, to take fifty cubic centimetres of the wine, to saturate ten cubic centimetres of it by potash, to add to them the forty others, to take one-fifth of the mixture and add to it fifty cubic centimetres of ethero-alcoholic mixture. If the wine contain free tartaric acid, a more abundant precipitate is produced than with the primitive liquid. The excess of acid in the precipitate corresponds nearly to half the weight of the free tartaric acid of the wine. The process has always been applicable to the wines we

have analysed, because their total acidity much exceeds that of the cream of tartar they contain. Now, the co-existence of neutral tartrate of potash and an organic acid is not admissible, for a solution of tartrate of potash, to which is added a trace of acetic or any other acid, then treated by the ethero-alcoholic mixture, gives a precipitate of cream of tartar.

We have, moreover, verified the exactness of the process by adding small quantities of tartaric acid to Formichon wine, and afterwards recovering it in the precipitate.

3. Applying this process to the examination of various wines, we found that most of them contain no free tartaric acid. We have ascertained this fact especially with regard to the following wines:—Formichon, 1860–61–62; Savigny, 1859–60–61, frozen; Savigny, 1862 (red and white Pinot); ordinary Montpellier; Mèdoc, 1858; Saint Emilion, 1857.

In a very few instances the addition of potash increases the precipitate, as with Formichon, 1858, and Brouilly, 1858 (free acid equal to half the acid contained in the cream of tartar), and with Formichon, 1859. In the latter wine the free tartaric acid was double that of the cream of tartar, and equal to 2·2 gr. per litre; the total tartaric acid, free and combined, =3·3 gr., the largest proportion of tartaric acid we have found in any wine. The smallest quantity was in frozen Savigny, 1861 (tartaric acid= 0·7gr. per litre), and in altered Sautenay, 1858 (0·4 gr.). In most instances the total weight of tartaric acid is given in that of the cream of tartar, of which it represents four-fifths.

The absence of free tartaric acid in most of the wines examined is a very important fact. Indeed, the acidity of the cream of tartar represents but a fraction of their total acidity. In the Formichon of 1858, for instance, the total acidity.* is equal to 7·4 gr. of tartaric acid per litre, while that of cream of tartar represents only 1·1 gr. of tartaric acid, and that of tartaric acid exceeds 0·5 gr.; there is then an acidity equivalent to 5·8 gr. resulting from other acids. Succinic acid makes at the most 1·5 gr., according to M. Pasteur's experiments, and acetic acid, a few decigrammes, according to those of M. Béchamp. There then remains an acidity equal to about 4

* This acidity does not include carbonic acid, which we took care to eliminate, but which does not exist very abundantly in old wines.

grammes, representing fixed acids, little or not at all known (see M. Maumené's work, p. 104). To this amount must be further added the weight of acids combined with the bases contained in the wine. These facts indicate the need of further researches in the study of wines.—*Chem. News, London*, Oct. 10, 1863, from *Comptes-Rendus*, lvii., 394.

PRESERVATION OF GRAPES AND OTHER FRUITS.

By M. le Docteur Rauch.

Various means, more or less successful, have been suggested for preserving grapes,—a fruit most delicious and wholesome, but very difficult to keep.

One of the simplest ways is to dip the ends—the stalks of the bunches—in sealing-wax, and to suspend them from poles or cords in a cellar or cool room, where they will not be exposed to frost. By carefully removing any berries that may decay, grapes in this way may be preserved till the end of December. They generally preserve their freshness longer in a cellar than in a room, where the air is dryer; and this applies to nearly all other fruits. For this reason plums may be preserved for months in vessels filled with sand, hermetically sealed, and buried in the ground; exclusion of the air having the same effect in each case.

In the south of Russia there is another way of preserving grapes. They are gathered before they are quite ripe, put into large pots, and so filled with millet that each fruit is separate, and the pots are covered so as to render them air-tight. They are sent in this way to the markets of St. Petersburg. After remaining thus for a whole year, they are still very sweet, all their sugar being developed by the ripening process in the pots.

Recent experiments show that cotton possesses the useful property of preserving various substances. Meat-broth in a bottle, lightly closed with cotton, has been found to keep unaltered for more than a year. After this it was a natural course to try its preservative effect on various other substances, and in America cotton has long been successfully used for preserving grapes, in the following manner:—

The branches are left on the vine-stock as long as possible, even to the early frosts, provided they are but slight. The

bunches are then cut with a sharp knife, all the damaged fruit removed with scissors, and then left for several days in a cool room. They are then put between layers of ordinary cotton, handling them very carefully, and placed in vessels such as tin boxes, or glass preserve pots, taking care not to put too many layers, so as to crush the lowermost. The receptacles are then covered and sealed. The latter precaution is certainly of use, though American farmers generally disregard it, and nevertheless have good grapes often as late as April. The fruit is kept in a cool place, but out of the reach of frosts.

Apples and pears are still more easily preserved in cotton, through it retards their ripening, which wool on the contrary, accelerates. American farmers therefore, a few days before they wish to eat the fruit, wrap it in wool, when it ought to take a beautiful golden color; and pears ripened in this way are sold for almost double the price of those still a little unripe.

The most recent method was invented by a Frenchman, M. Charmeux, whose grapes, exhibited at several exhibitions, excited considerable attention. His method I have tried, and found it succeed very well. He attaches great importance to the maintenance of a certain degree of humidity. His directions are as follows :—

Leave the fruit on the vine as long as the season allows, cut off the bunches so as to leave a piece of the branch adhering to the stalk, comprising about two nodules above and three or four below. Carefully cement the upper end of the branch, and place the lower end in a phial filled with water, containing a little powdered charcoal, to prevent decomposition. Close the phial with wax, place the grapes in straw or cotton, in a cool room, but screened from frost. It might be better to hang them up, which could easily be done if the phials are well sealed. In this way, and by occasionally picking out any decayed grapes, I succeeded in preserving them from the autumn of 1859 to the beginning of April, 1860, and when I found the fruit excellent. They might, no doubt, be kept longer in a cellar, or in some place where the temperature is constantly at the same low degree, and darkness would probably be favorable to their preservation. —*Chem. News, London, Oct.* 31, 1863, *from Moniteur Scientifique*, v., 74.

ON THE DESTRUCTION OF NOXIOUS INSECTS BY MEANS OF THE PYRETHRUM.

By C. Willemot.

Of all substances hitherto proposed for the destruction of noxious insects, powders have been found the only ones that can be used to advantage, on account of their simple and easy method of application, All such powders, too, which have been employed, so far as known, are derived from the vegetable creation. It would occupy too great a space to enumerate here all the plants used in a form of powder for this purpose; it will suffice to mention some which have been more particularly under observation. Among these are the straight-leaved pepperwort (*Lepidium ruderale*, Linn., and *Thlaspi ruderale*, Desfon.), found growing in uncultivated places and among rubbish around Paris. This is used in Southern Dalmatia, in the form of powder, almost exclusively for the destruction of fleas. In some parts of Southern Russia, especially in the Crimea, a plant very common in France, *Aristolochia Clematitis*, Linn. (common birthwort), is used exclusively to destroy bugs. Sawdust of aromatic wood, particularly American Cedar (*Cedrela odorata*, Linn.), is largely sold for the destruction of insects, and, according to some authorities, most of the powders sold in Paris for that purpose are composed of that substance. But after using and experimenting with them we have been fully convinced that the object cannot thus be perfectly attained. Their action is feeble, or they merely stupefy for a time the insect, which soon recovers its strength and sensibility to do injury.

The greater number of the plants which furnish the most satisfactory means for the destruction of insects are of the genus *Pyrethrum*. Many observers, considering the botanic resemblance (as well as similar properties of this genus) with kindred ones, as certain chamomiles, the *Anthemis Cotula* for instance, have pretended that such indigenous plants (chamomiles) may specifically furnish a powder for destroying insects equal in every respect to the *Pyrethrum*. But accurate and detailed experiments by ourselves and other competent observers refuse such assertion. All the efficacy of the *Anthemis Cotula* consists in rendering the insects insensible for a time, instead of

destroying them. The inhabitants of the regions of Europe and Asia, near the Caucasian mountains, seem to have been the first to discover the properties of the *Pyrethrum*, and try on a large scale the powders obtained from these plants. The species employed differ according to the different localities.

It is easy to comprehend that the inhabitants of the Caucasus choose for their use that kind which is most abundant in their own country. Thus, in Armenia they prefer the red Pyrethrum (*P. roseum*, Biebers), commonly called "lowizachek," or flea plant.

The Persian powder, which appears most extensively used, is almost wholly composed of the flesh-colored Pyrethrum (*P. carneum*, Biebers.) Dr. Ch. Koch, in his "Travels in the East" gives very curious details respecting this precious species in the Caucasian regions. In the "Journal de la Société Impériale et Centrale d' Horticulture de la Seine," vol. iii., 1857, p. 756, also may be found an analysis of a note by Mr. Neumann, of Breslau, on the "Culture and Preparation of the Powder of the *Pyrethrum carneum*."

We may here remark, in passing, that in countries where the most frequent use has been made of these powders of *Pyrethrum*, they have only been applied to the destruction of those insects which are troublesome in dwellings. Our object has been to select from the different plants the one which presents the greatest range of efficacy; and we have been more exacting in this than heretofore has been the case in seeking a plant of incontestable efficacy for the destruction of insects, and which can be so applied, not only to vermin in the house, but also to those insects which every year commit such great ravages upon the cereals, fruit-trees, leguminous and ornamental plants, etc. A plant was desirable which can easily be acclimatized in France, the properties of which, in its wild state in its native regions, are neither destroyed nor weakened by cultivation, and which can be raised with but slight attention to its culture. We want, finally, a productive plant, to the end that the powder it furnishes may be sold at a very low price. Such a plant we are now fortunate enough to introduce for the public use. Its efficacy has been fully proved by a great number of persons, as will be seen hereafter; its acclimatization is very satisfactorily

evinced: its culture is most simple; its properties are wholly retained; the production is very abundant; now nothing remains but its extensive propagation, which, however, is not without many difficulties. We will not disguise the fact that the great success so far attained by no means makes us suppose the task accomplished, but it nevertheless encourages us to continue our efforts with new perseverance. It was about 1850 when the first powder of Pyrethrum was introduced into France for the destruction of insects in houses. The powder came exclusively from provinces of the Caucasus, of Persia, and Dalmatia. Our researches have proved to us that that from the Caucasus is the best. For a number of years the inhabitants of those countries have successfully used the powder of the Pyrethrum to protect themselves against the ravages of numerous insects.

For a long period, a preparation was used throughout the Russian Caucasus for the destruction of injurious insects, and was regarded as a secret by the rest of the world, until its properties became known to Mr. Jumtikoff, an American merchant, while travelling through that country some forty years ago. He communicated his discovery to his son, who manufactured the article in 1828. This powder, or the plant from which it was obtained, was soon after introduced into Alexandropol, and subsequently the powder got into use in Germany and France, where its popularity is rapidly increasing. At present there are more than twenty villages in the district of Alexandropol engaged in cultivating the plant and collecting its flowers. The plants from which this powder is produced consist of small perennial shrubs, from twelve to fifteen inches in height, bearing flowers an inch and a half in diameter, and resembling those of the ox-eye daisy (*Chrysanthemum Leucanthemum*).

They grow on the mountains of the Caucasus, at an elevation of 5650 feet above the level of the sea, in a temperature of 68° Fahr. They are easy of cultivation in gardens, and since their hardiness has become known they have been introduced into Germany, Holland, and France, for the purposes of ornament, when they begin to flower in June. They will flourish in any ordinary garden soil, and may be propagated by layers as well as by seed.

The parts of the plants from which the powder is made are

the dried flower-heads, gathered when ripe, on fine days, and usually dried by exposure to the sun; but they have been found to be more serviceable when dried in the shade, during which operation they are occasionally turned. In the process of desiccation they lose about 90 per cent. When perfectly dried, they are first comminuted with the hand, and then reduced to powder in a small mill.

A quantity of these plants grown upon eighteen square rods is estimated to furnish one hundred pounds of powder, which is best preserved in sealed vessels of glass. The application is made either as a powder or as an infusion, though in the latter form it is more beneficial, especially when intended for the destruction of insects on plants. The powder may be employed directly to the insects themselves, or in the places which they frequent. They are attracted by its smell, become stupefied, and immediately die. This substance may be employed without injury to the larger animals, or to man. It is intimated that the amount of this powder consumed annually in Russia alone is about 500 tons.

The inhabitants of the Caucasus and adjoining countries who used these powders had only a very limited knowledge of their plants, and did not suspect that one among them, the *Pyrethrum Willemoti*, Duchartre, would be called upon to render the most effective service to agriculture and horticulture, achieving the preservation of food, wool, furs, and the comfort of man and the domestic animals, etc.

These powders had been introduced into France for several years before a choice had been made among them, and the special importance of this particular species recognized. The high price, and the numerous adulterations they have undergone, diverted the public from this acquisition, and from a public appreciation of its efficacy. Submitted to a close analysis, these powders, as sold, have been found to be mixed with dangerous substances, which in due regard to public safety require to be vigorously excluded from sale. In them sumac powder is a common ingredient, from its close resemblance to the Pyrethrum powder; and also Jalap, cockle of Levant, nux vomica, and even arsenic, enter into the composition of the powders we have examined.

It was not till 1856, and after many efforts, that we could procure some good seeds of the Pyrethrum of the Caucasus. We were then able to extend our researches as to the culture of the plant. We had to proceed cautiously in determining the soil best adapted to it, to find out the best exposure, and to discover the care necessary to be bestowed on it. The first sown, on September 15, 1856, produced only a few shoots. A great point was to ascertain whether the plant was an annual or perennial. In order to determine this, several of the procured plants passed through the winter of 1856–57, and sustained from 8 to 12 degrees of cold without appearing to suffer.

The seeds gathered from this first culture were sown in February, 1858. In May, we communicated our experiments, and the success that had crowned them, to Messrs. Decaisne, Neumann, and Pepin. These gentlemen then examined the plant botanically, and their opinions are as follows:—(Here follows a botanical description of the genus *Pyrethrum*, and of the particular plant just referred to, from which it appears that the present species has not hitherto been described; hence M. Duchartre has named it *Pyrethrum Willemoti.*

Culture and Gathering.—The Pyrethrum, though a native of the Caucasus, where it grows abundantly and at a slight elevation above the level of the sea, under a latitude warmer than that of Paris, succeeds very well on good soil in France. It is very hardy, and can sustain without hazard the severe winter there. A few years' experience has taught the writer that it is little sensible to cold, and that it needs no shelter during the winter. It has been asserted that the kindred species which also grow in the Caucasus have rather suffered than benefited by the shelter given to them. The soil best adapted to the culture of the plant is a pure earth somewhat siliceous and dry. Moisture and the presence of dung is injurious, the plant being extremely sensitive to a mass of water, and would in such case immediately perish. A southern aspect is the most favorable. The best time for putting the seed in the ground is from March to April. It can be done even in the month of February if the weather will permit it. After the soil has been prepared and the seeds are sown, they are covered by a stratum of soil mixed with some vegetable mould, and the roller is slightly applied to

it. Every five or six days the watering is to be renewed in order to facilitate the germination.

At the end of about thirty or forty days the young plants make their appearance, and as soon as they have gained strength enough they are transplanted. Three months after, they are transplanted again at wider distances, according to their strength, each time being of course watered, but only moderately.

The blossoming commences in the second year towards the end of May, and continues to the end of September. Within that period the heads from which the powder is made must be gathered. The most favorable time for gathering seems to be when the heads are about to open,—that is, when the florets of the circumference are yet standing erect. In this state the fecundation takes place, and the essential oil contained in the heads has reached its highest state of developement. The stalks and leaves, through having the properties in a less degree, may be used also for making powder, but they must be mixed with the flowers in the proportion of a third of their weight. The powder thus obtained will perfectly answer the destruction of insects. Toward the end of September, at which time the blossoming has ceased, the stalks are cut at about four inches from the ground. As the flowers are cut they are dried in a granary or shed, great care, however, being taken not to expose them to moisture or to the rays of the sun. When completely dried the flowers are to be hermetically closed up in sacks, so as to prevent too early pulverization. In pulverizing them it is better not to take a larger quantity than the wants of the moment may require. The volatilization, which is of course more rapid in the powdered form than in flowers, will thus be avoided. It has been suggested that the drying of the flowers for making the powder might be effected on sheet-iron plates, like tea-leaves are dried in China, but this operation is most injurious to the plant, dissipating the essential oil.

Pulverization.—Among the numerous methods which we have tried in order to simplify the pulverization of the dried flowers, that which appears the best is to pound the flowers in a mortar. The mortar should be covered with a piece of leather, through which the pestle moves, adjusting it in such a way as to prevent

any contact from without, as is usually done in pulverizing drugs in a laboratory. The quantity to be pulverized should not exceed a pound at a time, thus avoiding too high a degree of heat, which would be injurious to the quality of the powder. The pulverization being deemed sufficient, the substance is sifted through a silk sieve, and the residue, with a new addition of flowers, is put into the mortar and pulverized again.

This method of preparation is so simple as to be within the reach of all; the pulverization by steam is more rapid and effectual, but necessarily more expensive. The best receptacles for holding the powder seem to be bottles; these, if well corked, will keep out moisture, which is so injurious to the properties of the powder. If the powder is not to be kept long, small boxes will do as well as bottles.

Insects destroyed by the Powder.—The principal insects to which the powder is destructive may be ranged under four classes:—first, insects injurious to agriculture and horticulture; second, insects obnoxious to man and his habitation; third, insects destructive to certain substances, as wool, furs, feathers; and, fourth, insects injurious to museums of animal and vegetable products, and collections of natural history. We do not pretend to enumerate all the insects to which the powder is destructive; it will suffice to mention a few instances, which will sufficiently show what applications may be made of it. Our domestic animals,—dogs, cats, fowls, pigeons, etc.,—are subject to annoyance from insects which cannot withstand the effects of this powder. Of the numerous insects injurious to agriculture and horticulture we may mention the following which have been destroyed by it:—the weevil, bark-beetle, wheat-fly, maggots, cocci, aphides, earwigs, spiders, ants, etc. It is evident that not only the perfectly developed insects are destroyed, but also the larvæ, which in some cases do greater injury than the insects themselves. Large depots where military stores or navy supplies are kept, and especially extensive bakeries, may use the powder with great advantage for the destruction of weevils, midges, crickets, cockroaches, etc., the great plague of those establishments. The powder is equally efficacious in destroying insects which are a constant source of annoyance to the inhabitants of cities and the country. Gnats and mosquitoes are banished;

bugs, fleas, and flies disappear from houses under its influence. As to manufactured articles, the powder is applied effectually to the following:—

1. Furs.—These require great care for their preservation. Numerous insects live upon them. Their propagation is rapid. The only remedy against their ravages hitherto has been pepper or camphor, but by using the powder of Pyrethrum the insects and their larvæ will be most effectually destroyed.

2. Feathers.—The same result will be arrived at by using this powder for the preservation of the costly products of feather dealers. Most woollen products have also a number of insect enemies, especially in their undeveloped state, as larvæ. The powder of Pyrethrum, if applied in proper time, will effectually preserve all woollen articles. Natural history, too, has its share of the advantages afforded by this powder in the preservation of collections of mammalia, birds, fishes, reptiles, insects, and anatomical preparations.

Herbariums are very frequently devastated by insects gradually piercing the paper as well as the dried plants, reducing the latter almost to a powder, more especially if they have not been poisoned by chloride of mercury dissolved in alcohol—a substance both expensive and dangerous. By applying a pinch of the powder between the leaves of his herbarium, the botanist will soon get rid of the enemies of his collection. Finally, a most important advantage of this powder is that it is innocuous to man, and can be absorbed by the human subject without the slightest danger to his health. Some physicians of celebrity even assert that the powder can be advantageously sprinkled upon sores or open wounds that diffuse an unpleasant odor.

Mode of applying the Powder.—In using the powder it must be applied carefully and in sufficient quantity, otherwise the result will be unsatisfactory, especially if used against some of the hardy or very resisting species of insects. Occasionally the powder, by being exposed to the air or moisture, will have lost its destructive properties, so as to render the result doubtful and wholly inefficient; at others the result has been unsatisfactory, because the most favorable moment for the operation has been overlooked. A rainy or wet day, for instance, always lessens the destructive efficacy, because the powder, containing a very

volatile essential oil, renders the conservation of this principle extremely difficult.

Of all the methods for applying the powder to plants attacked by insects, including the vine, the bellows will best accomplish the object. As there is only a small quantity of powder thrown at once, the loss will be very small, whilst in any other way a good deal of it will fall upon the ground. The powder should be directly applied to the parts operated on, and with care and precaution it may be made to penetrate into the most accessible part of a plant. If, for instance, a plant has been attacked by plant lice, which are often hidden or masked by thick foliage, it will become necessary to turn aside this foliage, so as to have the insects exposed, and the powder directly brought into contact with them.

In all cases these operations should take place on a warm day, the morning being always preferable. A slight moisture arising from the morning dew will make the powder more easily adhere to the spots where it is applied, and maintain its properties long enough to cause the death of the insects. The insufflation should be renewed several times, according to the nature and number of insects to be destroyed. The first operation generally stupifies them, while at the second or third application they lose their strength, fall to the ground, and die sooner or later.

In order to prevent the ravages of the wheat-midge, the powder is mixed with the grain to be sown, in the proportion of about two ounces to two or three bushels, which will save a year's crop.

For insects in dwellings the insufflation may be performed by bellows of a smaller size than those used in agriculture and horticulture. Proper care should be taken to make the powder penetrate to the recesses where the insects lodge. Household furniture ought to be scrupulously searched, and bedsteads and sofas sprinkled in the evening. By continuing this for several days, the premises will be thoroughly rid of insects.

For the preservation of furs, woollen garments, or patterns, it is necessary, at the approach of spring, to sprinkle the articles abundantly with the powder, the object in contemplation being, not the destruction of the insects, but the preventing their reappearance.—*Pharm. Jour. and Trans., Lond., Oct.*, 1868, from *the Technologist.*

PRACTICAL THOUGHTS ON LIGHT.

By James S. T. W. Smith.

Some time ago, while sitting at my desk, I observed that one of the show carboys in the window had focussed the sunlight on my coat-sleeve, and was burning it. It is quite possible that many fires may have taken place in this way when no satisfactory reason could be given for their occurrence. It would be well in arranging goods and show-glasses in druggists' shops, to bear in mind this fact, and to so place goods (especially any which would readily take fire) that focussed rays of light would never fall on them.

The circumstance caused me to reflect upon the general influence which light exerts upon pharmaceutical preparations stored in shops; and knowing the prejudicial effects of light upon chemicals, it is very natural to ask if it cannot to a great extent be prevented from doing so much injury.

In order that the subject may be made as plain as possible, it may not be amiss to give a general idea of the *nature* of light, and *how* it acts. To be as brief as possible, it may be remarked that a ray of light has been found to have three distinct properties at the least; namely, the property of giving *heat* and *light*, and the power of producing *chemical action*.

Men of science have demonstrated this for us by passing a ray of light through a prism, and then examining the spectrum produced. The spectrum, as first produced by Newton, appeared to him to consist of *seven* primitive colors; but since his time others have represented that there are only *three*, and that the seven are produced by the mixing of the edges of the colored bands in the spectrum. Thus assuming blue, red, and yellow to be the primitive or fundamental colors, the other colors of the spectrum are represented to be produced by the meeting and overlapping of the bands, blue and yellow, for instance, producing green. It has been found that the red ray contains the most heat, the yellow ray the most light, and the blue, or violet ray, exercises the greatest amount of chemical action. But while the heating effect of the ray of light extends beyond the visible part of the spectrum at its red extremity, so also the chemical effect, or *actinism* as it is called, extends beyond the visible

part of the spectrum at the other or violet end. It has therefore been assumed that the heating and chemical effects are due to vibrations which, although they accompany those of light, are nevertheless distinct from them. For our present purpose, however, we may consider that the heating, luminous, and chemical effects of light are associated with the colored rays mentioned, and that the heating and actinic rays are those that do the greatest amount of damage to goods. Yellow glass completely prevents actinic action, and white opaque glass is the best adapted for keeping anything cool. It appears to be quite a mistake to keep wines and syrups in *dark* colored bottles, for dark colors absorb heat most readily; and opaque white glass would be cooler, on account of its reflecting the heat from its surface instead of absorbing it. It is quite evident that if the plate-glass in our shop windows was tinted with pale yellow, many things might be placed in the window without the risk of suffering so much damage as they many times do; and if all our bottles were tinted yellow, many chemicals would keep longer in good condition. It would be interesting to know the exact effects produced upon different substances by keeping them in bottles of various colors.* In some cases, such as in the preservation of salts of silver, the iodides, etc., yellow glass would appear to be the best, on account of its preventing chemical action. There might be instances where chemical action was not so intense in its effects; but where the *heating* rays of light do most harm by elevating the temperature and giving encouragement to fermentation, as in the case of syrups, or in causing too much evaporation, as with ethers, in the first instance yellow glass bottles would be the best antidote, and in the second, white opaque glass would be the best, because the

* Some interesting and important information on the effects produced on vegetable colors by the different colored rays of light will be found in a paper by Sir J. Herschel, in the Philosophical Transactions for 1842. It appears that the vegetable colors are affected by the luminous rays rather than the chemical ray, and that the rays most effective in destroying a particular color are those which are complementary to it. Thus, vegetable blues are most affected by the red orange and yellow rays, purple and pinks by the yellow and green rays, and orange yellows by the blue rays. —Ed. Pharm. Journ.

coolest. When we wish to bleach oils in our windows, it would be well for us always to be particular what tint the glass bottle has into which we place the oil. *Colorless* glass, of course, would be the best. It is possible that light affects the brilliancy of our tinctures as much as the air. Take tincture of myrrh for example: when it becomes muddy, the remedy suggested is to make up (with more spirit) the deficiency lost in evaporation; but the addition of the spirit does not dissolve the deposit, nor yet brighten the tincture. The insoluble sediment is said to be *oxidized:* now this is questionable, for gums in the preparation of varnishes are said to be much more *easily* dissolved by being freely exposed in a powdered state to the action of the air, or, in other words, *oxidized.* May the light (in this case and many others) not be the cause of chemical action?

The use of yellow bottles on our shelves might change the appearance of shops; it would compel the use of a different kind of label, as the gold label would not contrast well with yellow bottles. Chevreul's principles would lead us to choose a label of a violet hue, or a color complementary to yellow, so that the harmony of colors might be preserved.

The objection to the use of the yellow glass in the *window* would be that it might interfere with the health of assistants by checking that portion of the light which is so essential to life. I remember having seen somewhere an account of some factory inspector who objected to yellow coloring in houses, as he always found the people most unhealthy in them. The subject may possibly be worthy the attention of those versed in such matters.—*Lond. Pharm. Journ., Nov.*, 1863.

Hexham, October 15, 1863.

POISONOUS PROPERTIES OF THALLIUM.

M. Lamy, through M. Dumas, tells the Academy of Sciences that thallium—one of the new bodies discovered through spectral analysis—has poisonous properties. A very small quantity suffices for the destruction of dogs, rabbits, and fowls. The chief symptoms are intestinal pains, tremblings, paralysis of lower extremities, and death. M. Lamy was led to consider thallium a poison, in consequence of having experienced, during his pre-

paration of it, symptoms which were new to him, and amongst them, a remarkable feeling of weariness. Its presence in the body is readily shown. A portion of any part of the body poisoned by it, not bigger than a pea, is enough for the analyst. Its presence will be instantly disclosed by spectral analysis. We shall hear more of this, no doubt; for M. Lamy has presented M. Bernard with a quantity of thallium for experiment—the society for the protection of animals notwithstanding. We need hardly add, that thallium will be rapidly introduced into the practice of medicine. We shall now every day expect the announcement from some *confrère* of the wonderful "effects of thallium" in epilepsy or some other like incurable disease, with, of course, a list of cases distinctly illustrative of the statements and belief of the author.—*Med. News and Library, Dec.*, 1863, from *Brit. Med. Jour.*, Sept. 12, 1863.

RESULTS OF AN EXAMINATION OF THE PROCESS FOR MANUFACTURING PRUSSIATE OF POTASH.

By the late Mr. John Lee, and Dr. Richardson.

These experiments were made as far back as 1847, but the notes had been overlooked, and were only found when it became necessary to prepare an account of the manufacture of this salt for the new edition of the Chemical Technology.

The experiments were made in gun-barrels, and the same mixture of materials was employed in each case. Clean horn, carefully rasped, was mixed with the best potashes and iron filings. A small quantity of water was added, to assist in making an intimate mixture, which was carefully dried and reduced to a fine powder. This mixture was composed of,—

Horn,	16·00
Potashes,	17·72
Iron,	3·00
Moisture,	3·28
	40·00

A potash-charcoal was made by soaking 13 parts of wood-charcoal with a solution of 4 parts of potashes, and then perfectly dried.

A gun-barrel was partially filled with the mixture, and exposed to a red heat in a separate furnace. In the first and second series of experiments, the gases generated in the gun-barrel were passed through the potash-charcoal which was maintained at a red heat in an iron tube placed in another furnace. In the third series of experiments, the gases were passed through hydrochloric acid, and in the last experiments, the gases escaping from the iron tube containing the potash-charcoal, were conveyed through hydrochloric acid and then through a solution of potash. In the last series, the gases which escaped, were collected and analysed.

In each case, the prussiate was extracted and crystallised. The ammonia was determined in the usual way, but in the tabulated results which followed, the ammonia is given in its equivalent of crystallised prussiate of potash.

The theoretical yield of prussiate was 382·50, and the actual quantities obtained, were as follows :—

	I.	II.	III.	IV.
Retort .	101·97	135·46	146·93	141·08
Tube .	68·26	63·54	—	71·00
Acid .	—	—	140·24	58·80
Potash .	—	—	—	2·75
Total .	170·22	199·00	287·17	273·63
Loss .	212·28	183·50	95·33	108·87
Produce per cent.	44·5	52·2	75·1	71·5

The gases were not collected until the air had been expelled from the apparatus, and consisted of—

Hydrogen	46·00
Carburetted Hydrogen	14·66
Carbonic Oxide	25·34
Nitrogen	14·00
	100·00

It would therefore appear that part of the nitrogen of the animal matters is eliminated in its ultimate form, and cannot be made available in this manufacture. It would also appear that a modification of the apparatus used by manufacturers would

probably be followed by a much larger produce than is at present obtained.—*Chem. News, Lond., Oct.*10, 1863.

NOTE ON CASSIA MOSCHATA, H. B. K.

By Daniel Hanbury, Esq., F. L. S.*

Read June 18th, 1863.

The genus *Cassia*, as constituted by Linnæus, furnishes to medicine, as is well known, two drugs of some importance, namely *Senna leaves* and the pods called *Cassia fistula*, in connexion with the second of which I beg leave to submit to the Linnean Society the following observations.

Although the name *Cassia fistula*, which is the common commercial designation of the drug, is properly applied to the ripe legumes of *Cassia Fistula*, L., only, it sometimes designates those of *C. brasiliana*, Lam., and, as I shall presently show, those also of a third species of *Cassia*. The legumes of the first-named, which, on account of the laxative saccharine pulp contained between their transverse septa, find a place in many of the pharmacopœias of Europe, are familiar to most botanists; they are straight or slightly curved, cylindrical, smooth, indehiscent woody legumes, 1½ to 2 feet long by ¾ to 1 inch in diameter, and of a deep chocolate color. The legumes of *C. brasiliana*, which are seen in commerce but rarely, differ from those of *C. fistula* in being compressed and thicker, and in having two prominent ridges marking their ventral suture and one similar ridge their dorsal; from each suture ramify prominent nerves, giving a rough surface to the legume, which is increased by a cracking and exfoliation of the epidermis. The third form of the drug was distinguished several years ago by Professor Guibourt, of Paris, who described it under the name of *Petite Casse de l'Amérique*, observing that it differs from ordinary *Cassia fistula* in being of smaller size, in containing a pulp of pale color and austere, astringent, yet saccharine taste, in the seeds being separated by thinner septa, and in the extremities of the legumes being apiculate instead of rounded. M. Guibourt regarded these pods as derived from a variety of

* [Communicated by the author.—Ed. Am. Jour. Pharm.].

Cassia fistula, L., or possibly from a different species. My friend Mr. Morson has also observed some *Cassia*-pods of unusually small size imported into the London market from New Granada, and which were apparently identical with M. Guibourt's drug. In some of them, which he was kind enough to give me, I could detect no differences which appeared sufficient to distinguish them from the legumes of *Cassia Fistula*, L., to which plant I referred them, attributing their slight variation to want of culture or a poor soil. A few months ago, however, Mr. Sutton Hayes, of Panama, (to whose kindness I am indebted for many interesting communications), sent me several pods marked *Cañafistola de purgar*, which I recognized as the small variety of *Cassia* of Messrs. Guibourt and Morson. In reply to my remark that they were derived from *Cassia Fistula*, L., Mr. Hayes observed, "I think you are wrong as to the tree which produces the pods I sent you being a form of the true *C. Fistula*. I have often seen both trees; and the true *C. Fistula* is much less like the *Cañafistola de purgar* than many other species of *Cassia*. The flowers of *C. Fistula*, L., are of light yellow and in very long racemes, and the leaflets are different in shape and much larger. The flowers of the *Cañafistola de purgar* are yellow, becoming brick-red with age; the racemes are much shorter than those of *Cassia Fistula;* and the leaflets are altogether different, being much smaller and quite like those of *C. brasiliana;* in fact, the *Cañafistola de purgar* is much nearer *C. brasiliana* than it is to *C. Fistula*. The wood of the tree is very dark-colored, heavy, and compact, and is considered one of the best on the Isthmus: it makes excellent fuel. The tree is very common in open woods on hills, and is perfectly indigenous; whereas *C. Fistula* is to be found only about towns and in old cleared places, as if introduced. I have never seen *C. Fistula* in the virgin forests. *C. brasiliana* is very common about Panama."

Upon examining Mr. Hayes's plant and comparing it with the species of *Cassia* already described, I have found it to agree with the *Cassia moschata* of Humboldt, Bonpland, and Kunth, so far as the characters of that plant have been recorded; and M. Triana, who is now engaged on the Flora of New Granada, and has compared Mr. Hayes' specimens with the type specimens in Paris, has arrived at the same conclusion. As the

notices of this plant hitherto published are quoted entirely from the 'Nova Genera et Species,' the authors of which had not seen the flowers, I have thought it desirable to draw up a complete description, which, with a drawing, I have now the honor of laying before the Society.

CASSIA. Sect. *Fistula*, DC. Subsect. *Ebracteatæ*.

C. MOSCHATA (H., B., K., Nova Genera et Species, vi. 338); arborea; foliolis multijugis, oblongis, apice rotundatis, utrinquepubescentibus deinde supra glabrescentibus, antheris glabris, leguminibus cylindricis.

DC. Prod. ii. 489; Vogel, Synopsis Generis Cassiæ, 11; Walp. Rep. i. 812; *Cathartocarpus moschatus*, Don, Syst. of Gard. and Bot. ii. 453.

Hab. Ad isthmum Panama, ubi ab incolis *Cañafistola de purgar* vocatur (*Sutton Hayes*, No. 58); ad fluvium Magdalena (*Humboldt et Bonpland*, *Triana*); ad ripam fluminis Casiquiare paulo infra ostium superius, arbor unicus ab Orinoco, ubi abundare dicitur, allatus (*Spruce*, No. 3300); ad pagum Villavicencio prope Bogota (*Triana*, No. 4376).

Arbor 30–40-pedalis, ramulis novellis flavescenti-pubescentibus. *Folia* alterna, abrupte pinnata, petiolo communi 4–10 poll. longo, pubescente, supra pubescentia ampliore flavescente. *Foliola* 10–18-juga, subopposita vel alterna, oblonga, inæquilatera, basi utrinque rotundata, apice obtusa, interdum mucronulata, reticulato-venosa, 1¼–2 poll. longa, 6–7 lineas lata, margine integerrimo, pubescente, nervo medio subtus prominente, pubescente, pagina foliolorum superiore nitida parce et breviter pilosa vel glabrescente, inferiore fuscescenti-pilosa vel puberula. *Stipulæ* triangulares, caducæ. *Racemi* laterales, 6–10-pollicares, simplices, graciles, puberuli. *Flores* flavi, mox rubescentes. *Pedicelli* ad 5 lineas longi, gracillimi, minute pubescentes. *Calyx* quinquesepalus, puberulus vel glabrescens, sepalis rotundatis, obtusis, concavis, reflexis. *Petala* quinque, concava, reticulato-venosa, flava, glabra, subæqualia, semipollicaria; superius ovale, longe unguiculatum, altera suborbiculata, breviter unguiculata. *Stamina* decem, inæqualia, glabra; quatuor inter se æqualia, corolla parum breviora; tria his triplo vel quadruplo longiora, curvata, basi geniculata; tria brevissima, quorum lateralia incurva, medium filamento crasso, dilatato. *Antheræ* staminum quatuor breviorum ellipticæ, bilobæ, basi et

apice biporosæ, dorso medium versus affixæ; antheræ staminum trium longiorum late ellipticæ, birimosæ, introrsum dehiscentes, basi affixæ; antheræ staminum trium brevissimorum birimosæ, tribus supradescriptis haud dissimiles sed valde minores. *Ovarium* longe stipitatum, lineare, adscendens, falciforme, margine superiore basin versus parce pilosum, aliter glabrum. *Stigma* oblique truncatum. *Legumen* cylindricum, rectum, 1–1½-pedale, lignosum, durum, læve, corticatum, breviter apiculatum vel obtusum, septis transversis numerosis ut in *Cassiæ Fistulæ*, L. legumine (cui simillimum) instructum. *Semina* ovato-rotundata, compressa, nitida, durissima, 3 lineas longa, coloris cinnamomei, in succo saccharino adstringente immersa.

Cassia moschata, as remarked by the authors of the 'Nova Genera et Species,' as well as by Mr. Sutton Hayes, is nearly allied to *C. brasiliana*, Lam., but it is easily distinguished from that plant by its comparatively glabrous yellow flowers and its totally different legumes. These legumes are stated by both Mr. Hayes and M. Triana to be used in medicine in New Granada instead of those of *C. Fistula*, L.; so that their occasional appearance in European commerce is not surprising. They differ from the latter by their smaller size, less regularly straight and cylindrical form, and especially by their paler and less saccharine pulp, which, when fresh, is stated to have a slightly musky odor. These characters are of but little value botanically; the leaves, however, of *C. moschata*, its shorter racemes and nearly glabrous ovary, amply suffice to distinguish it from *C. Fistula*, L.—*Trans. Linnæus Society, vol. xxiv.*

DETECTION OF NITRIC ACID IN POTABLE WATER BY MEANS OF BRUCINE.

By R. Kersting.*

The author makes a solution of one part of brucine in 1000 parts of water. He pours a cubic centimetre of this solution into a glass, and adds a cubic centimetre of the water under examination for nitric acid; he then pours very slowly down the side of the glass a cubic centimetre of sulphuric acid, so that the acid may form a layer at the bottom of the glass. Then, if nitrates are present in water, a zone of rose-color appears on

* *Annalen der Chem. und Pharm.*, bd., cxxv., s., 254.

the surface of the acid. The zone turns yellow on its lower surface, but remains without further change for some hours. By carefully shaking, the glass the rose color may be made to reappear above the yellow zone.

A cubic centimetre of water containing $\frac{1}{100000}$th of nitric acid shows the reaction very decidedly, but it may be seen when the amount of acid is ten times less.

As the sulphuric acid, the brucine, and water employed to dissolve it may contain nitric acid, this source of fallacy must be guarded against, and the author recommends that the water should be distilled from potash, the sulphuric acid distilled with about 5 per cent. of carbonate of ammonia collecting only three-fourths of the acid, and the brucine well washed with distilled water.—*Chem. News, London, Oct.* 17, 1863.

ON THE PRODUCTION OF CRYSTALLINE LIMESTONE BY HEAT.

In this *Journal*, vol xxxii. p. 112, an abstract is given of Rose's experiments on the deportment of carbonate of lime at a high temperature. Among other interesting conclusions drawn by Rose, he says that "chalk or compact limestone cannot be converted into crystalline limestone (or calc-spar) by exposure to a high temperature in closed vessels, and as a general fact, that rhombohedral carbonate of lime is not formed in the dry way." Further, "that the so-called crystalline marble, obtained by Sir James Hall in his experiments, was probably nothing more than a slightly coherent but otherwise unaltered mass, which Hall erroneously considered to be crystalline marble."

Rose states, in a recent communication to the Berlin Academy of Sciences, that he was not entirely satisfied with his former results, especially as Dr. Horner, President of the Geological Society of London, assured him that he had inspected the specimen of marble made by Sir James Hall, and that it differed entirely from the amorphous product obtained in the Berlin experiments. Rose, therefore, repeated his investigations on the subject, and has now obtained results which differ entirely from those he formerly published, and which fully confirm the correctness of Sir James Hall's conclusion, that marble can be produced by exposing massive carbonate of lime to a high temperature under

great pressure. The experiments were made with aragonite from Bilin, in Bohemia, and with lithographic limestone. In one case, the mineral was heated in a wrought-iron cylinder, and in the other, in a porcelain bottle, special precautions being taken to exclude the air, and make the vessels as near air-tight as possible. These were exposed to a white heat for half an hour, and, on cooling, both the aragonite and the lithographic limestone were found to be converted into crystalline limestone, the former very much resembling Carrara marble, and the latter a grayish-white granular limestone. The change took place without any material decomposition, the resulting marble containing a trifle less carbonic acid than the lithographic limestone from which it was produced.—*Amer. Jour. Sci. and Arts, Sept.* 1863, from *Pogg. Ann.*, cxviii. 565. G. J. B.

ON PHLORIDZINE AND ITS USES.

By Dr. De. Ricci.

Phloridzine is a neutral principle existing in considerable quantities in the bark of the root of the apple, plum, and cherry trees, but principally in the root of the apple tree. It appears in the market in the form of a dirty-whitish powder, consisting of broken-up, silky needles, somewhat resembling quinine which has not been well bleached, and when rubbed between the fingers it has a soft, velvety feel, very like that of French chalk. When crystallized by slow cooling from a dilute solution, previously treated with freshly prepared animal charcoal, phloridzine may be obtained perfectly white, and in the form of long silk needles. Its taste is peculiar, being bitter at first, but afterwards somewhat sweetish, with a flavor of apples. Phloridzine differs from quinine by containing no nitrogen in its chemical composition, but in this respect it resembles salicine, to which it is much allied. Like salicine, it does not combine with acids, to form salts, is very soluble in alcohol, ether, or boiling water, but requires one thousand parts of cold water for solution.

The cases in which Dr. De Ricci has employed phloridzine with most success have been certain forms of atonic dyspepsia occurring in delicate females, to whom it was impossible to administer either bark, quinine, or salicine in any shape, without

bringing on serious nervous excitement. He has also found it extremely well adapted for the treatment of young children of delicate constitutional habit, or when recovering from whooping-cough, infantine fever, or any other disease. The doses he has employed are five grains three or four times a day for adults, and proportionately smaller doses for young children. In prescribing phloridzine it must be borne in mind that it is almost insoluble in cold water, but the addition of a very small quantity of ammonia instantly dissolves it; thus, by adding to an eight ounce mixture, containing a drachm of phloridzine, a few drachms of aromatic spirit of ammonia, the fluid which was previously milky becomes perfectly clear, and the addition of the aromatic spirit rather improves the mixture than otherwise. Dr. De Ricci relates the case of a young lady of a strumous constitution, suffering from chlorosis, in which the effects of phloridzine were manifestly favorable. The patient was unable to take iron in any shape, and both quinine and salicine equally disagreed with her; but phloridzine agreed perfectly well, and her constitution improved so much under its use that she was subsequently able to take citrate of iron and strychnia in grain doses which ultimately effected a perfect cure. Dr. De Ricci thus recapitulates the advantages of this drug; it is tolerated in cases where neither quinine, nor salicine, nor bark, can be administered with impunity; it is particularly adapted to young children, it is not expensive, and it is abundantly supplied in Great Britain, thus rendering us independent of the rapidly diminishing cinchona forests of South America.—*Dublin Quar. Jour. of Medical Science. August*, 1863.

PICONITRATE OF POTASH AS A VERMIFUGE.

Some months ago Dr. Friedrich, of Heidelberg, described, in Virchow's *Archiv*, the beneficial effects of piconitrate of potash in cases of trichnia. The remedy has also been employed in tænia. Dr. Walter, of Offenbach, relates the case of a woman aged 30, who had *tænia solium* for several years. During fifteen months he had employed all known remedies for tapeworm, including the bark of the root of the pomegranate, considered by some as infallible. On November 15, 1862, he gave the patient five pills, each containing five *centigrammes* of piconitrate

of potash.* On the 20th, an entire worm was expelled with the head. Four days after taking the medicine, the patient presented a jaundiced appearance.—*Dublin Med. Press*, May 27, 1863, from *Archiv fur Pathol. Anat. und Phys.*

ON THE COLORING PRINCIPLE OF VOLATILE OILS AND A NEW BODY, AZULENE.

By Septimus Piesse, F. C. S.

It is generally known that essential oils or ottoes of plants have peculiar and characteristic colors, they are either yellow, blue, green, brown, or white, *i. e.* colorless.

Having made some progress towards the discovery of the nature of the matters which impart these several colors, I now record the facts ascertained.

The principal interest rests with the blue substance which gives color to the otto of chamomile, because the same body is present in other volatile oils, and imparts to them a green color, being at the time under disguise by a yellow resin, which is also present in volatile oils of a green tint.

When blue otto of chamomile is subjected to fractional distillation, the white hydrocarbon anthemidine is easily separated from the blue coloring, because the latter requires a much higher temperature to vaporize it than the former.

By the fractional distillation of otto of wormwood, Absinthii, I obtain first a nearly colorless hydrocarbon, then at the third fractioning an oil having a brilliant green color, which at the fifth fractioning divides into a blue oil and a residuary yellow resin.

When otto of Patchouly, obtained by distilling with water the Indian herb *Pogostemon Patchouly*, is subjected to fractional distillation, I obtain in like manner, first a colorless hydrocarbon, then, but not till the eleventh fractioning, a beautiful blue oil and a brown-yellow residue; the great number of fractionings required to separate the blue oil in this case is caused by the closer boiling-points between the patchouly hydrocarbon, the blue oil, and the resin, all of which are exceedingly high. The

[This is also known as picrate, nitropicrate and carbazotate of potassa. The acid is made from coal tar creosote, from Australian gum, and from oil of wine wintergreen. A short notice of it will be found in the appendix of the U. S. Disp. 11th Edition.—Ed. Am. J. Ph.]

otto of bergamot from the rind of the fruit, *Citrus bergamia*, as also otto of Ceylon Lemon-grass, *Andropogon Schœnanthus*, yield by the same treatment small portions of this blue coloring. By repeated rectification of the blue fluid, from whatever source derived, I at length render it free from extraneous matter and in a state of purity, it then has a fixed boiling-point of 576° F., its sp. gr. 0·910; when boiled, it produces a dense vapor of a blue color, having special optical* characters. I have named this substance Azulene, from azure—blue. The analysis of Azulene shows its formula to be:—

C 16	82·05	81·21
H 13	11·12	10·95
O	6·83	7·84
	100·00	100·00

Or, $C_{16}H_{12}+HO$.

The yellow coloring-matter which imparts its tint to the several ottoes, appears to be an oxidised portion of the otto so stained. In nearly all instances, ottoes which are colorless when first obtained from their source become yellow by age, *i. e.*, oxidation. This, however, is not universal, as the otto of nutmeg remains colorless for a lengthened period, even when air is drawn through it by an aspirator.

The oxidised portion of the yellow-colored oils, when separated from the pure otto in which it is dissolved, are true resins; the majority of ottoes oxidize during the act of distillation, hence from this cause they vary in color from pale-yellow to red-brown. When new, that is, freshly distilled, several essen-

* Sir David Brewster has optically examined two blue ottoes which owe their color to the presence of azulene, namely *Matricaria Chamomilla* and *Achillea Millefolium*. "Without entering," says Sir David, "into details respecting the general action of these oils upon the different colored portions of the spectrum, I shall confine myself to a slight notice of their specific action in which they differ from all the various bodies which I have yet examined.

"Between the two lines A and B, of Fraunhofer's map of the spectrum, there are two groups of lines shown in that map. The two oils absorb the light in these portions more powerfully than in the portions adjacent to them. No other fluid or solid on which I have made experiments acts in a similar manner; but what is very remarkable, the earth's atmosphere exercises a similar action when the sunlight passes through its greatest i ckness at sunrise and sunset."

tial oils are of a pale-green, but indicating the presence of azulene; but as oxidation proceeds, the yellow resin generated conceals the azulene. We have—

A. Ottoes which are colorless, containing neither azulene nor resin.

B. Ottoes which are yellow, containing resin only.

C. Ottoes which are blue, containing azulene only.

D. Ottoes which are brown-green and yellow-green, containing azulene and resin together, in proportions varying as optically indicated.

It is remarkable how little azulene gives color to an oil that contains no yellow resin: the otto of chamomile is familiarized to us by its blue color, but it does not contain one per cent. of azulene; Patchouly otto, which yields six per cent., and wormwood otto, which gives three per cent. of azulene, do not appear at all blue, owing to the presence of an excessive quantity of yellow resin.

At the third fractioning of wormwood, the yellow resin and the azulene are in due proportions to form a green solution, and such is probably the case with other ottoes known for their green color, such as Caguput, but which I have not yet examined.

Of the chemistry of azulene, and the part it plays in connection with odorous bodies, I hope soon to eliminate some fresh facts and to place them before the reader.—*London Pharm. Jour., Dec.*, 1863.

NEW FEATURES IN THE SUPPLY OF PERUVIAN BARK.

By John Eliot Howard, F. L. S.

A considerable quantity of medicinal bark has recently been introduced into the London market, coming by way of Pará, on the Amazon. It consists of flat and quill bark packed in serons, and imitating to a considerable extent the *primâ facie* appearance of Calisaya bark. It is probable that, from this cause, it has excited high anticipations on the part of the importers, which are scarcely destined to be realized. The examination for alkaloids shows the same proportion to be contained in the flat and in the quill portions of the bark, evidently from the same tree; the chief difference in the chemical

contents appearing in the greater abundance of chincho-tannic acid in the quills. The alkaloids weighed as first precipitated, gave in each case twenty-eight grains per 1000, the larger portion of which consisted of the quinidine of Pasteur, together with cinchonine, and a very small percentage of quinine.

The novel course which this bark has travelled suggests questions as to its origin, which can only be answered hypothetically. When Mr. Pritchett was in Huanuco in 1860, he says, "The expectations of the inhabitants were at the highest respecting the future prosperity of the city, *on account of a grand road, which was already commenced,* for connecting the province of Huanuco with the river Ucayali, the largest and most important of the southern tributaries of the Amazon." It is, then, not improbable that we have some of the first results in the present importations. It is not the first time that bark has been sent down this river-navigation of some thousand miles to the Atlantic.

The produce of the forest of Huanuco has often been attempted to be passed off for Calisaya (as I have described under the head *C. nitida* in my "Illustrations of Pavon's Quinologia.") I have specimens of this dated as far back as 1846. In MM. Delondre and Bouchardat's "Quinologie" will be found very full information on this subject, under the head Quinquina Huanco plat, p. 27, also pl. iv. M. Delondre says, "No species resembles more, at first sight, the bark of Bolivia, and for a long period those who collected it sold it as true Calisaya. It is, doubtless, the species described by Ruiz and Pavon as the *C. nitida,* and to which they attributed a very superior quality. The surface is of a tawny yellow, uniform with longitudinal marks, less distinct than the Calisaya. The texture of the inner surface is less compact than this last. The transverse fracture is of a more pink color, the fibres are shorter, but do not easily detach themselves. When chewed, the bitterness readily develops itself; the taste is slightly poignant without astringency." This description, together with M. Delondre's plate, accord sufficiently well with the present specimens (presented to the Pharmaceutical Museum)* to allow of its being produced by

* These specimens were exhibited at the meeting, and their characteristics briefly alluded to by Professor Bentley.

the same tree, of which (*C. nitida*) Mr. Pritchett brought back a fine but perhaps varied specimen from Tingo, some thirty miles lower down the river than Huanuco, and possibly the site of the present gathering.

I think, therefore, that we must in all probability seek for the source of the present importation in the *nitida* barks of the Huanuco district. At the same time, it is not at all improbable that other species of bark may find their way, ultimately, down the numerous affluents of the mighty Marañon, even from the forests of Bolivia and of Cochabamba. The present will scarcely repay the importers. M. Delondre gives, as the result of some experience, the produce as fifteen to twenty grammes of sulphate of quinine, and eight to ten grammes of cinchonine per kilogramme; a produce which accords very well with that which I have found in the present parcel, bearing in mind that M. Delondre includes *quinidine* under the head *quinine*, as he himself tells us (pp. 30, 37),—a fact which detracts from the value of his otherwise very valuable work.—*Lond. Pharm. Journ., Dec.*, 1863.

Editorial Department.

Our Journal.—With the present number begins the thirty-sixth volume of this Journal, which has continued uninterruptedly since April, 1829. In its earlier days, when the material for supplying the pages of such periodicals was much less abundant than at present, the work was smaller, and involved less outlay of capital to carry it on; yet, from the sparsity of its subscribers, it was a burthen to the College. In process of time it became self-supporting, and at the commencement of the year 1860 was yielding a moderate surplus, which aided the Trustees of the College in reducing the debt on their building. Owing to the large reduction of the subscription list since the rebellion, the income of the Journal has ceased to meet its expenses, and has again become in part a burthen to the College. This condition need not to have occurred if all our subscribers had been faithful to their obligations in forwarding their dues within a reasonable time after they were justly due. Our books exhibit delinquencies of this kind to the amount of about $1600, independent of that due from Southern subscribers, varying in sums from six to thirty dollar

or from two to ten years' subscriptions. It is therefore with earnestness that we appeal to this class of our subscribers, in the hope that they will come forward and square their accounts *now* that aid is needed. It has been our aim to make this Journal a record of the progress of pharmacy and pharmaceutical chemistry, without introducing much that merely caters to a taste for novelty or business fashion. There are some subscribers who value a pharmaceutical journal solely in proportion to the material it contains that is conducive to business. Hence they hail the appearance of recipes for preparations of various kinds with pleasure and approval. Without abandoning the plan upon which this Journal has been conducted for so long a series of years, it is intended to introduce, when such offer, notices of apparatus, processes, and preparations, under the name of Pharmaceutical Notices; and we shall be pleased to receive contributions to this chapter from any of our readers or friends who may have something to communicate which may be deemed too little for a paper.

To the Editor of the American Journal of Pharmacy.

Sir,—An old subscriber, and constant reader of your excellent *Journal of Pharmacy* wants information on one or two points, and if you, or any of your readers, will furnish it in an early number, you will much oblige me and several professional friends.

Jeremie's Solution of Opium, p. 242, and Tincture of Sumbul, p. 244, are neither of them officinal, but are referred to in Braithwaite's Retrospect, part 47, July, 1863, but not known in Drug Stores. What are they? and where described?

Farradism is now frequently spoken of as a new mode of applying Electricity to medical purposes; but no one seems to know the nature of it; likewise the nature of the machine for producing it, by Legendre and Morin. Is it made in this country? and where? Where can a general description be found, or can you furnish one? It will much oblige.—Page 243, Vol. above mentioned.

Since the invention of the Spectroscope in 1860, by Bunsen, in Germany, several new metals have been discovered. Information is wanted of the nature and operation of this instrument; where is it described? and how used? and if for sale in this country? &c.

We are not acquainted with "Jeremie's solution of Opium," and none of the authorities within our reach allude to its composition. "Tincture of Sumbul" is made of the strength of tincture of valerian, which it resembles. A formula for fluid extract of Sumbul (or musk-root) was published at page 233, vol. 3d, third series of this Journal, and articles on musk-root itself in vol. xvi. and xxiii. of the previous volumes.

The fluid extract is the form in which this singular product of Asia has been employed pharmaceutically in Philadelphia. Dose of the fluid extract 15 minims to half a fluid-drachm. This is equivalent to 7½ to 15 grs. of the root.

Farradism is a name given by M. Duchesne, of Boulogne, to the induced magneto-electric current applied as a therapeutic agent, and so-called to

distinguish it from the mechanical electrical current on the one hand, and the galvanic or chemical electrical current on the other. Our correspondent will find a full account of the apparatus, illustrated by a wood-cut, and its mode of application, together with the theory of its action, at page 507, vol. i., of Prof. Wood's Therapeutics and Pharmacology, ed. 1856, and Messrs. McAllister, Chestnut street, Philada., can give him the information of its cost, etc.

The *Spectroscope* of Bunsen was described and figured in this Journal for May, 1861, to which our correspondent is referred. We would also inform him that Prof. Robert Bridges, of the Philadelphia College of Pharmacy, has a good Spectroscope in working order at the Hall of the College, and would give our correspondent an opportunity to witness its wonderful powers if applied to. Dr. Bridges has specimens of salts of several of the new metals prepared for the Spectroscope. McAllister (as above) imports the instrument, and we believe some excellent instruments have been made in this country.

Pharmaceutical Society of Great Britain.—We acknowledge the reception of a pamphlet of 36 pages, exhibiting the present condition and scope of this Institution, and embracing extracts from the Charter, Pharmacy Act, and By-Laws of the Society, and the regulations of the Board of Examiners of the School of Pharmacy, etc. We have not space to devote to an analysis of this pamphlet, but will say that it exhibits a prosperous condition of the Pharmaceutical Society, and an outline of the labors carried on under its auspices, in its School of Pharmacy, its Museum, its Laboratory, and the various examinations imposed on it by the Pharmacy Act, etc. With ample means, and a large and varied amount of talent in the ranks of its members, this Society has made great advances in the improvement of our scientific art, and has shed its light freely for the advantage of the profession at large.

The Medical Formulary: being a collection of prescriptions, derived from the writings and practice of many of the most eminent physicians in America and Europe, together with the usual dietetic preparations and antidotes for poisons. To which is added an appendix on the endermic use of medicines, and on the use of ether and chloroform. The whole accompanied by a few brief pharmaceutical and medical observations. By Benjamin Ellis, M. D. Eleventh edition, carefully revised and much extended, by Robert P. Thomas, M. D., Prof. Mat. Med. in the Philadelphia College of Pharmacy. Blanchard and Lea, 1864; pp. 341, octavo.

One of the best tests of the practical usefulness, or general merit of a formulary is, that it sells well, that it is sought for by medical men as suggestive of remedies in cases that are daily presented in practice, and that its suggestions have proved reliable and useful. Measured by this rule, "Ellis's Medical Formulary" must be considered one of the very

best. A comparison of this edition with the previous one, and especially with the older editions, will exhibit marked changes, and many improvements. Obsolete or disused formulæ have been omitted, and many new recipes, from printed or private sources, introduced, the nomenclature corrected to correspond with the new Pharmacopœia, and the table of doses, first introduced by Dr. Thomas, carefully revised.

Obituary.

Prof. Eilhard Mitscherlich.—Prof. Mitscherlich has recently died at Berlin at the age of sixty-nine. He had long been known as one of the ablest philosophical chemists of the day, and the estimation in which he was held was exemplified by the numbers who attended his classes in the University of Berlin, and the Friedrich-Wilhelm's-Institut in that city. The mere titles of his writings would occupy nearly two columns of this journal; they embrace a wide range in chemical science, and may be found in the publications of the Academy of Sciences of Berlin, of which he was a member, and in German periodicals. Besides these, he was the author of a "Lehrbuch der Chemie," in two volumes, which has passed through two editions, and has been translated into French. Dr. Mitscherlich was elected a Foreign Member of the Royal Society in 1828; and in 1829 one of the Royal Medals was awarded to him for his "Discoveries relating to the Laws of Crystallization and the Properties of Crystals." It is, perhaps, by his researches into the phenomena of dimorphism that he will be best remembered.—*Am. Jour. Science and Arts, Nov.*, 1863, from *Athenæum*, No. 1876, p. 470.

Prof. Theodor W. C. Martius.—We have to announce with regret the death of this amiable and well-known man of science, which took place, after a long and suffering illness, on the 15th September. Dr. Martius held for many years the Professorship of Pharmacy and Pharmacognosy in the University of Erlangen; he was a Knight of the Royal Prussian Order of the Red Eagle, and member of many scientific societies, including the Pharmaceutical Society of Great Britain, to whose Museum and Journal he frequently contributed.—*London Pharm. Jour., Oct.* 1863.

Catalogue of the Class of the Philadelphia College of Pharmacy.

FOR THE FORTY THIRD SESSION, 1863-64.

With a List of their Preceptors and Localities.

MATRICULANTS.	TOWN OR COUNTY.	STATE.	PRECEPTOR.
Armstrong, Wm. E.	Philadelphia,	Pennsylvania,	T. Morris Perot & Co.
Beecher, A. C. W.	"	"	Charles Shivers,
Blair Andrew	"	"	Andrew Blair.
Blomer, Augustus P.	"	"	Wm. M. Reilly.
Bourke, Joseph M.	"	"	T. N. Penrose.
Bowman, D. F.	Cincinnati,	Ohio,	W. J. M. Gordon & Bro.
Buehler, Edward H.	Harrisburg,	Pennsylvania,	Wyeth & Bro.
Buss, Oliver	Catasauqua,	"	C. H. Eggert.
Campbell, Hugh	Philadelphia,	"	J. Dunton.
Clark, Leonard S.	"	"	
Clark, George R.	"	"	
Clark, Thomas C. Jr.	"	"	H. C. Eckstien, M. D.
Collins, Granville S.	"	"	Wm. Ellis & Co.
Combes, Matthew	"	"	Matthew Combes.
Cooper, Edward	Ashland,	"	Charles Lins.
Cornell, Edward A.	Williamsport,	"	Charles Ellis, Son & Co.
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Cressman, Theodore	"	"	L. M. Emanuel.
Croft, Henry C.	Chambersburg,	"	Henry C. Blair.
Culbert, Joseph W.	Philadelphia,	"	J. T. Williams, M. D.
Cunningham, Jn. M.	"	"	Caleb R. Keeney.
Ditman, Andrew J.	"	"	Peter Niskey.
Ebert, Albert E.	Chicago,	Illinois,	F. Mahla, Ph. D.
Evans, J. Estell	May's Landing,	New Jersey,	French, Richards & Co.
Evans, Jonathan	Philadelphia,	Pennsylvania.	Charles Ellis, Son & Co.
Gold, Hiram	Easton,	"	John De Lacy, M. D.
Graham, Fleming B.		Illinois,	Lancaster & Wills.
Gross, George A.	Harrisburg,	Pennsylvania,	Thomas S. Wiegand.
Hance, John C.	Bucks Co.,	"	R. A. Hance.
Harry, J. W.	Conshohocken,	"	D. W. Harry.
Heller, Marx M.	Cleveland,	Ohio,	T. J. Husband.
Heymann, H.	Philadelphia,	Pennsylvania,	W. T. Taylor, M. D.
Hill, Frederick A.	"	"	H. S. Haines.
Hillary, John F.	"	"	Wm. Hillary.
Huber, Milton	Norristown,	"	Wm. Stahler.
Irvine, A. W.		"	French, Richards & Co.
Israel, Julius		Germany,	G. Mannel.
Jeannot, Geo. Edward	Locle	Switzerland,	J. R. Angney, M. D.
Jones, Edward C.	Philadelphia,	Pennsylvania,	A. H. Yarnall.

CATALOGUE OF THE CLASS.

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Jones, Woodruff	Philadelphia,	Pennsylvania,	
Keen, Francis	"	"	I. N. Marks.
Kennedy, Charles W.	"	"	Edmund Pollitt.
Kennedy, George	"	"	John Moffit.
Kester, George B.	"	"	Wm. Ellis & Co.
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Moore, Joseph E.	"	"	James L. Bispham.
Morris, Henry B.	"	"	Jenks & Middleton.
Newbold, Henry A.	"	"	Powers & Weightman.
Newbold, Thomas M.	"	"	French, Richards, & Co.
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Notson, George W.	"	"	Wm. Notson, M. D.
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Pile, Gustavus	Philadelphia,	"	Wilson H. Pile, M. D.
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Schroeder, Luther J.	York,	"	E. B. Garrigues.
Schultheis, Christian	Quincy,	Illinois,	L. M. Lyon.
Segner, William	Palmyra,	Pennsylvania,	J. P. Fitler, M. D.
Shallcross, Aaron P.		Ohio,	Edward Parrish.
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Smith, H. A.		Ohio,	U. S. Hospital, W. P.
Smith, Wilson B.	Philadelphia,	Pennsylvania,	Wm. H. H. Githens.
Stadelman, S. F.	"	"	George Ashmead.
Thatcher, Jesse P.	"	"	J. G. Allen, M. D.
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Welchans, Geo. R.	Lancaster,	"	J. C. Turnpenny & Co.
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Wendell, Frederick	"	"	John Wendell, Jr.
Wilson, Frank W.	"	"	Wm. M. Shoemaker.
Young, Charles L.	Lower Merion,	"	A. M. Burden, M. D.